Australian Government

MEM Manufacturing and Engineering

Release: 2.1

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MEM10119 Certificate I in Engineering

Modification History

Release 1. Supersedes but is not equivalent to MEM10105 Certificate I in Engineering

Qualification Description

This qualification defines entry-level skills and knowledge to assist workers entering employment as engineering/manufacturing employees within the metal, engineering, manufacturing and associated industries.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license. Licensing information is included in the relevant units of competence.

No other descriptor can be used.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM10119 Certificate I in Engineering units of competency to a value of 16 points must be achieved, chosen as outlined below:

- core unit of competency listed below (totalling 2 points) and
- elective units of competency to a value of 14 points from Group A.

Appropriate elective units to the value of 4 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate I. Only select units that would be suitable for occupational outcomes in an engineering/manufacturing environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

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Unit code	Unit title	P	Pre req
MEM13015	Work safely and effectively in manufacturing and engineering	2	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05013	Perform manual production welding	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07003	Perform routine machine setting	4	*
MEM07024	Operate and monitor machine and process	4	*
MEM07028	Operate computer controlled machines and processes	2	*

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Unit code	Unit title	P	Pre req
MEM07029	Perform routine sharpening and maintenance of production tools and cutters	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08014	Apply protective coatings (basic)	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*
MEM11008	Package materials (stores and warehouse)	2	*
MEM11011	Undertake manual handling	2	*
MEM11013	Undertake warehouse receival process	4	*
MEM11016	Order materials	2	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13001	Perform emergency first aid	1	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or	2	*

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Unit code	Unit title	P	Pre req
	related activities		
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MEM18013	Perform gland packing	2	*
MEM19002	Prepare jewellery illustrations	4	*
MEM19003	Handle gem materials	2	*
MEM19006	Replace watch batteries	1	*
MEM19010	Produce rubber moulds for lost wax casting process	2	*
MEM19011	Perform wax injection of moulds for lost wax casting process	2	*
MEM19014	Perform hand engraving	4	*
MEM20001	Produce keys	4	*
MEM20002	Assemble and test lock mechanisms	6	*
MEM20003	Install and upgrade locks and hardware	4	*
MEM27029	Maintain wheels and tyres	2	*
MEM50002	Work safely on marine craft	1	*
MEM50003	Follow work procedures to maintain the marine environment	1	*
MEM50004	Maintain quality of environment by following marina codes	1	*
MEM50009	Safely operate a mechanically powered recreational boat	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

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Qualification Mapping Information

Release 1. Supersedes but is not equivalent to MEM10105 Certificate I in Engineering

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20219 Certificate II in Engineering – Production Technology

Modification History

Release 1. Supersedes and is equivalent to MEM20205 Certificate II in Engineering – Production Technology

Qualification Description

This qualification defines the skills and knowledge required of an engineering/manufacturing employee within metal, engineering, manufacturing and associated industries.

The skills associated with this qualification are intended to apply to a wide range of engineering/manufacturing work, including production, distribution, stores and warehousing. It provides the skills and knowledge for a person to be responsible for the quality of their own work, work from complex instructions and procedures, coordinate work in a team environment or work individually under general supervision and assist in the provision of on-the-job training of other workers.

This qualification is specifically designed to cover the skills and knowledge required of workers employed as Engineering/Manufacturing Employees - Level IV as defined in the Manufacturing and Associated Industries and Occupations Award.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and/or materials to cover the scope of application of those units. All outcomes must reflect the standard of performance required of the work associated with the Unit/s.

This qualification is not suited and should not be used for people who are not employed in an engineering production or manufacturing environment, nor should it be used for school students unless they are formally engaged in a traineeship in accordance with the Australian Apprenticeships policy.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM20219 Certificate II in Engineering – Production Technology units of competency to the value of 64 points must be achieved, chosen as outlined below:

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- core units of competency listed below (totalling 18 points)
- elective units of competency to the value of 46 points from Group A.

Appropriate elective units to the value of 11 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate II. Only select units that would be suitable for occupational outcomes in an engineering/manufacturing environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM16006	Organise and communicate information	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

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Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM03005	Rework and repair (electrical/electronic production)	8	*
MEM03006	Set assembly stations	2	*
MEM04001	Operate melting furnaces	4	*
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*
MEM04007	Pour molten metal	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM04018	Perform general woodworking machine operations	4	*
MEM04019	Perform refractory installation and repair	4	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05009	Perform automated thermal cutting	2	*

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Unit code	Unit title	P	Pre req
MEM05012	Perform routine manual metal arc welding	2	*
MEM05013	Perform manual production welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05027	Perform aluminothermic welding	2	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM06001	Perform hand forging	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07003	Perform routine machine setting	4	*
MEM07004	Perform complex machine setting	8	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07024	Operate and monitor machine and process	4	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07029	Perform routine sharpening and maintenance of production tools and cutters	4	*
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07033	Operate and monitor basic boiler	6	*
MEM07041	Perform production machining	8	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*

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Unit code	Unit title	P	Pre req
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*
MEM08019	Electroplate protective finishes	6	*
MEM09002	Interpret technical drawing	4	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM10013	Install split air conditioning systems and associated pipework	6	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11002	Erect/dismantle intermediate scaffolding and equipment	4	*
MEM11004	Undertake dogging	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*

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Unit code	Unit title	P	Pre req
MEM11007	Administer inventory procedures	4	*
MEM11008	Package materials (stores and warehouse)	2	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11013	Undertake warehouse receival process	4	*
MEM11014	Undertake warehouse dispatch process	4	*
MEM11016	Order materials	2	*
MEM11019	Undertake tool store procedures	4	*
MEM11021	Perform advanced operation of load shifting equipment	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM11023	Operate a bridge and gantry crane	4	*
MEM11024	Undertake basic rigging	4	*
MEM11025	Operate a non-slewing mobile crane of greater than three tonnes capacity	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12024	Perform computations	3	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM13007	Maintain water treatment systems for cooling towers	2	*
MEM13013	Work safely with ionizing radiation	4	*

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Unit code	Unit title	P	Pre req
MEM14006	Plan work activities	4	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM16008	Interact with computing technology	2	*
MEM18002	Use power tools/hand held operations	2	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM18083	Handle fluorocarbon refrigerants according to regulations	1	*
MEM18084	Commission and decommission split air conditioning systems	4	*
MEM18086	Test, recover, evacuate and charge refrigeration systems	4	*
MEM18098	Prepare to perform work associated with fuel system installation and servicing	2	*
MEM27029	Maintain wheels and tyres	2	*
MEM27032	Service combustion engines	2	*
PMBPROD291	Operate resin infusion moulding equipment	2	
CPCCLDG3001A	Licence to perform dogging	0	
CPCCLRG3001A	Licence to perform rigging basic level	0	*
CPCCLSF2001A	Licence to erect, alter and dismantle scaffolding basic level	0	
CPCCLSF3001A	Licence to erect, alter and dismantle scaffolding intermediate level	0	*

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Unit code	Unit title	P	Pre req
PMBPROD294	Operate resin transfer moulding equipment	2	
PMBPROD298	Operate equipment using pre-preg material	2	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0004	Licence to operate an order picking forklift truck	0	
TLILIC0006	Licence to operate a bridge and gantry crane	0	
TLILIC0008	Licence to operate a non-slewing mobile crane (greater than three tonnes capacity)	0	

Qualification Mapping Information

Release 1. Supersedes and is equivalent to MEM20205 Certificate II in Engineering – Production Technology

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30119 Certificate III in Engineering – Production Systems

Modification History

Release 1. Supersedes and is equivalent to MEM30105 Certificate III in Engineering – Production Systems

Qualification Description

This qualification defines the skills and knowledge required of an engineering/manufacturing employee within metal, engineering, manufacturing and associated industries.

The skills associated with this qualification are intended to apply to a wide range of engineering/manufacturing work including production, distribution, stores and warehousing. It provides the skills and knowledge for a person to understand and apply quality control techniques, exercise good interpersonal and communications skills, work from complex instructions and procedures, exercise discretion within the scope of responsibility, perform work under limited supervision either individually or in a team environment, be responsible for assuring the quality of their own work, perform work which, while primarily involving the skills of the employee's qualification, is incidental or peripheral to the primary task and facilitate the completion of the whole task, inspect products and/or materials for conformity with established operational standards and assists in the provision of on-the-job training of other workers.

This qualification is designed to provide an industry recognised skills profile related to production work as an Engineering/ Manufacturing Employee - Level V. Competency development would typically be undertaken through an Australian Apprenticeships arrangement where the integration of on and off-the-job training would be specified in the Training Plan associated with the Contract of Training between the employer and trainee.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and/or materials to cover the scope of application of those units. All outcomes must reflect the standard of performance required of the work associates with the Unit/s.

This qualification is not suited and should not be used for people who are not employed in an engineering production or manufacturing environment. It is not suited and should not be used for school students unless they are formally engaged in a traineeship in accordance with the Australian Apprenticeships policy.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

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Packaging Rules

To be awarded the MEM30119 Certificate III in Engineering – Production Systems, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A Production Stream
- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

Appropriate Group B elective units to the value of 16 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in an engineering/manufacturing environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the qualification

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*

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Unit code	Unit title	P	Pre req
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A – Production stream units

Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM03005	Rework and repair (electrical/electronic production)	8	*
MEM03006	Set assembly stations	2	*
MEM04001	Operate melting furnaces	4	*
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*

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Unit code	Unit title	P	Pre req
MEM05027	Perform aluminothermic welding	2	*
MEM06001	Perform hand forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06006	Repair springs	4	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07003	Perform routine machine setting	4	*
MEM07004	Perform complex machine setting	8	*
MEM07024	Operate and monitor machine and process	4	*
MEM07025	Perform advanced machine and process operation	6	*
MEM07026	Perform advanced plastic processing	6	*
MEM07027	Perform advanced press operations	6	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07042	Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems	4	*
MEM07043	Identify causes of faulty aluminium extrusions	6	*
MEM07044	Test a new aluminium extrusion die	4	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*

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Unit code	Unit title	P	Pre req
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*
MEM08019	Electroplate protective finishes	6	*
MEM08020	Electroplate decorative finishes	6	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11002	Erect/dismantle intermediate scaffolding and equipment	4	*
MEM11003	Coordinate erection/dismantling of complex scaffolding/equipment	4	*
MEM11004	Undertake dogging	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*
MEM11007	Administer inventory procedures	4	*
MEM11008	Package materials (stores and warehouse)	2	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11012	Purchase materials	6	*
MEM11013	Undertake warehouse receival process	4	*

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Unit code	Unit title	P	Pre req
MEM11014	Undertake warehouse dispatch process	4	*
MEM11015	Manage warehouse inventory system	6	*
MEM11016	Order materials	2	*
MEM11017	Organise and lead stocktakes	4	*
MEM11018	Organise and maintain warehouse stock receival and dispatch system	6	*
MEM11019	Undertake tool store procedures	4	*
MEM11020	Perform advanced warehouse computer operations	4	*
MEM11021	Perform advanced operation of load shifting equipment	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM11023	Operate a bridge and gantry crane	4	*
MEM11024	Undertake basic rigging	4	*
MEM11025	Operate a non-slewing mobile crane of greater than three tonnes capacity	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM15005	Select and control inspection processes and procedures	4	*
MEM18003	Use tools for precision work	4	*
MEM18098	Prepare to perform work associated with fuel system installation and	2	*

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Unit code	Unit title	P	Pre req
	servicing		
CPCCLDG3001A	Licence to perform dogging	0	
CPCCLRG3001A	Licence to perform rigging basic level	0	*
CPCCLSF2001A	Licence to erect, alter and dismantle scaffolding basic level	0	
CPCCLSF3001A	Licence to erect, alter and dismantle scaffolding intermediate level	0	*
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0004	Licence to operate an order picking forklift truck	0	
TLILIC0006	Licence to operate a bridge and gantry crane	0	
TLILIC0008	Licence to operate a non-slewing mobile crane (greater than three tonnes capacity)	0	

Group B

Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM03005	Rework and repair (electrical/electronic production)	8	*
MEM03006	Set assembly stations	2	*
MEM04001	Operate melting furnaces	4	*

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Unit code	Unit title	P	Pre req
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*
MEM04007	Pour molten metal	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM04018	Perform general woodworking machine operations	4	*
MEM04019	Perform refractory installation and repair	4	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05013	Perform manual production welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05041	Weld using flame powder spraying	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*

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Unit code	Unit title	P	Pre req
MEM05052	Apply safe welding practices	4	*
MEM05053	Set and edit computer controlled thermal cutting machines	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM06001	Perform hand forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07003	Perform routine machine setting	4	*
MEM07004	Perform complex machine setting	8	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07024	Operate and monitor machine and process	4	*
MEM07025	Perform advanced machine and process operation	6	*
MEM07026	Perform advanced plastic processing	6	*
MEM07027	Perform advanced press operations	6	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07029	Perform routine sharpening and maintenance of production tools and cutters	4	*
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07031	Perform complex metal spinning lathe operations	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07033	Operate and monitor basic boiler	6	*
MEM07040	Set multistage integrated processes	6	*
MEM07041	Perform production machining	8	*

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Unit code	Unit title	P	Pre req
MEM07042	Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems	4	*
MEM07043	Identify causes of faulty aluminium extrusions	6	*
MEM07044	Test a new aluminium extrusion die	4	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM10004	Enter and change programmable controller operational parameters	2	*
MEM10011	Terminate and connect specialist cables	3	*
MEM10013	Install split air conditioning systems and associated pipework	6	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11002	Erect/dismantle intermediate scaffolding and equipment	4	*
MEM11003	Coordinate erection/dismantling of complex scaffolding/equipment	4	*

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Unit code	Unit title	P	Pre req
MEM11004	Undertake dogging	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*
MEM11007	Administer inventory procedures	4	*
MEM11008	Package materials (stores and warehouse)	2	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11012	Purchase materials	6	*
MEM11013	Undertake warehouse receival process	4	*
MEM11014	Undertake warehouse dispatch process	4	*
MEM11015	Manage warehouse inventory system	6	*
MEM11016	Order materials	2	*
MEM11017	Organise and lead stocktakes	4	*
MEM11018	Organise and maintain warehouse stock receival and dispatch system	6	*
MEM11019	Undertake tool store procedures	4	*
MEM11020	Perform advanced warehouse computer operations	4	*
MEM11021	Perform advanced operation of load shifting equipment	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM11023	Operate a bridge and gantry crane	4	*
MEM11024	Undertake basic rigging	4	*
MEM11025	Operate a non-slewing mobile crane of greater than three tonnes capacity	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12002	Perform electrical/electronic measurement	2	*

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Unit code	Unit title	P	Pre req
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12020	Set and operate coordinate measuring machines	2	*
MEM12025	Use graphical techniques and perform simple statistical computations	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM13013	Work safely with ionizing radiation	4	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM15005	Select and control inspection processes and procedures	4	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM18063	Terminate signal and data cables	4	*
MEM18071	Connect and disconnect fluid conveying system components	2	*
MEM18072	Manufacture fluid conveying conductor assemblies	4	*
MEM18083	Handle fluorocarbon refrigerants according to regulations	1	*
MEM18084	Commission and decommission split air conditioning systems	4	*
MEM18086	Test, recover, evacuate and charge refrigeration systems	4	*
MEM18098	Prepare to perform work associated with fuel system installation and servicing	2	*

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Unit code	Unit title	P	Pre req
MEM24001B	Perform basic penetrant testing	2	*
MEM24003B	Perform basic magnetic particle testing	2	*
CPCCLDG3001A	Licence to perform dogging	0	
CPCCLRG3001A	Licence to perform rigging basic level	0	*
CPCCLSF2001A	Licence to erect, alter and dismantle scaffolding basic level	0	
CPCCLSF3001A	Licence to erect, alter and dismantle scaffolding intermediate level	0	*
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
PMBPROD291	Operate resin infusion moulding equipment	2	
PMBPROD294	Operate resin transfer moulding equipment	2	
PMBPROD298	Operate equipment using pre-preg material	2	
PMBPROD391	Produce composites using resin infusion	4	*
PMBPROD394	Produce composites using resin transfer moulding	4	*
PMBPROD398	Produce composites using pre-pregs	4	*
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0004	Licence to operate an order picking forklift truck	0	
TLILIC0006	Licence to operate a bridge and gantry crane	0	
TLILIC0008	Licence to operate a non-slewing mobile crane (greater than three tonnes capacity)	0	

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Qualification Mapping Information

Release 1. Supersedes and is equivalent to MEM30105 Certificate III in Engineering – Production Systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30219 Certificate III in Engineering - Mechanical Trade

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Qualification Description

This qualification defines the skills and knowledge required of an engineering tradesperson – mechanical within metal, engineering, manufacturing and associated industries. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of mechanical trade work, including undertaking fitting, assembly, manufacture, installation, modification, testing, fault finding, maintenance and service of mechanical equipment, machinery and the use of machine tools.

This qualification is designed to provide an industry recognised skills profile related to trade work as an Engineering Tradesperson - Mechanical.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30219 Certificate III in Engineering - Mechanical Trade, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Groups A, B and C electives as described below
- elective units of competency to a maximum value of 23 points from Group D to bring the total value to 96 points.

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To be awarded the MEM30219 Certificate III in Engineering - Mechanical Trade (Machining), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A electives as described below
- elective units of competency to a maximum value of 23 points from Group D to bring the total value to 96 points.

To be awarded the MEM30219 Certificate III in Engineering - Mechanical Trade (Fitting), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group B electives as described below
- elective units of competency to a maximum value of 23 points from Group D to bring the total value to 96 points.

To be awarded the MEM30219 Certificate III in Engineering - Mechanical Trade (Fitting/machining), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group C electives as described below
- elective units of competency to a maximum value of 23 points from Group D to bring the total value to 96 points.

Appropriate Group D elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a mechanical trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

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Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

- Packaging for a generic qualification – choose a minimum value of 40 points in **any combination** from Groups A, B and C
- Packaging for a trade specialisation – choose a minimum value of 40 points from **one of either** Group A or B or C

Group A – Machining Trade specialisation

Unit code	Unit title	P	Pre req

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Unit code	Unit title	P	Pre req
MEM05005	Carry out mechanical cutting	2	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*
MEM07008	Perform grinding operations	4	*
MEM07009	Perform precision jig boring operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07011	Perform complex milling operations	4	*
MEM07012	Perform complex grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM18003	Use tools for precision work	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group B - Fitting Trade specialisation

Unit code	Unit title	P	Pre req
MEM05005	Carry out mechanical cutting	2	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*

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Unit code	Unit title	P	Pre req
MEM10006	Install machine/plant	4	*
MEM12006	Mark off/out (general engineering)	4	*
MEM18003	Use tools for precision work	4	*
MEM18004	Maintain and overhaul mechanical equipment	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies	4	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18018	Maintain pneumatic system components	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group C – Fitting/Machining Trade specialisation

Unit code	Unit title	P	Pre req
MEM05005	Carry out mechanical cutting	2	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*

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Unit code	Unit title	P	Pre req
MEM07008	Perform grinding operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM10006	Install machine/plant	4	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM18003	Use tools for precision work	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies	4	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18018	Maintain pneumatic system components	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group D – General electives

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Unit code	Unit title	P	Pre req
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05041	Weld using flame powder spraying	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM07002	Perform precision shaping/planing/slotting operations	4	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*
MEM07008	Perform grinding operations	4	*
MEM07009	Perform precision jig boring operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07011	Perform complex milling operations	4	*
MEM07012	Perform complex grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07021	Perform complex lathe operations	4	*

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Unit code	Unit title	P	Pre req
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07031	Perform complex metal spinning lathe operations	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07040	Set multistage integrated processes	6	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08014	Apply protective coatings (basic)	4	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM10004	Enter and change programmable controller operational parameters	2	*
MEM10005	Commission programmable controller programs	4	*
MEM10006	Install machine/plant	4	*
MEM10010	Install pipework and pipework assemblies	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11016	Order materials	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12020	Set and operate coordinate measuring machines	2	*
MEM13001	Perform emergency first aid	1	*

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Unit code	Unit title	P	Pre req
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18003	Use tools for precision work	4	*
MEM18004	Maintain and overhaul mechanical equipment	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies	4	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18010	Perform equipment condition monitoring and recording	4	*
MEM18011	Shut down and isolate machines/equipment	2	*
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18018	Maintain pneumatic system components	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.	3	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

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Unit code	Unit title	P	Pre req
MEM24001B	Perform basic penetrant testing	2	*
MEM24003B	Perform basic magnetic particle testing	2	*
MEM24005B	Perform basic eddy current testing	2	*
MEM24007B	Perform ultrasonic thickness testing	2	*
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30219 Certificate III in Engineering – Mechanical Trade (Release 1).

Release 1. Supersedes and is equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30319 Certificate III in Engineering - Fabrication Trade

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30305 Certificate III in Engineering - Fabrication Trade.

Qualification Description

This qualification defines the skills and knowledge required of an engineering tradesperson - fabrication within metal, engineering, manufacturing and associated industries. The qualification has been specifically developed to meet the needs of apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of fabrication work, including undertaking metal fabrication, structural steel erection, sheetmetal work, welding, blacksmithing and surface finishing.

This qualification is designed to provide an industry recognised skills profile related to trade work as an Engineering Tradesperson - Fabrication.

Assessment of some units of competency must, where indicated, include evidence of the candidate’s performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Groups A, B, C, D, E, F and G as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

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To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Boilermaking), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group B as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Welding), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group C as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Boilermaking/Welding), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group D as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 6 points.

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Sheetmetal working), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group E as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Blacksmithing), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)

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- elective units of competency to a minimum value of 40 points from Group F as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

To be awarded the MEM30319 Certificate III in Engineering – Fabrication Trade (Surface Finishing), units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group G as described below
- elective units of competency to a maximum value of 23 points from Group H to bring the total value to 96 points.

Appropriate Group H elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a fabrication trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*

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Unit code	Unit title	P	Pre req
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Packaging for a generic fabrication trade qualification - choose a minimum value of 40 points from Group A.

Packaging for a trade specialisation - choose a minimum value of 40 points from **one of either** Group B or C or D or E or F or G.

Group A - Fabrication Trade generic electives

Unit code	Unit title	P	Pre req
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*

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Unit code	Unit title	P	Pre req
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*

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Unit code	Unit title	P	Pre req
MEM05053	Set and edit computer controlled thermal cutting machines	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM08010	Manually finish/polish materials	6	*
MEM09011	Apply basic engineering design concepts	6	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group B - Boilermaking Trade specialisation electives

Unit code	Unit title	P	Pre req
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*

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Unit code	Unit title	P	Pre req
MEM05023	Weld using submerged arc welding process	4	*
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM09011	Apply basic engineering design concepts	6	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group C – Welding Trade specialisation electives

Unit code	Unit title	P	Pre req
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05011	Assemble fabricated components	8	*

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Unit code	Unit title	P	Pre req
MEM05012	Perform routine manual metal arc welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*

Group D – Boilermaking/Welding Trade specialisation electives

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Unit code	Unit title	P	Pre req
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*

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Unit code	Unit title	P	Pre req
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM09011	Apply basic engineering design concepts	6	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group E – Sheetmetal working Trade specialisation electives

Unit code	Unit title	P	Pre req
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*

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Unit code	Unit title	P	Pre req
MEM05037	Perform geometric development	6	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM09011	Apply basic engineering design concepts	6	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*

Group F – Blacksmithing Trade specialisation electives

Unit code	Unit title	P	Pre req
MEM05005	Carry out mechanical cutting	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM06001	Perform hand forging	4	*

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Unit code	Unit title	P	Pre req
MEM06002	Perform hammer forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06004	Select heat treatment processes and test finished product	6	*
MEM06005	Perform drop and upset forging	4	*
MEM06006	Repair springs	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM06008	Hammer forge complex shapes	4	*
MEM06009	Hand forge complex shapes	4	*

Group G – Surface Finishing Trade specialisation electives

Unit code	Unit title	P	Pre-req
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*

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Unit code	Unit title	P	Pre-req
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*
MEM08019	Electroplate protective finishes	6	*
MEM08020	Electroplate decorative finishes	6	*
MEM11009	Handle/move bulk fluids/gases	4	*

Group H – General electives

Unit code	Unit title	P	Pre req
MEM05001	Perform manual soldering/desoldering – electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*

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Unit code	Unit title	P	Pre req
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*
MEM05027	Perform aluminothermic welding	2	*
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05053	Set and edit computer controlled thermal cutting machines	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*

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Unit code	Unit title	P	Pre req
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM06001	Perform hand forging	4	*
MEM06002	Perform hammer forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06004	Select heat treatment processes and test finished product	6	*
MEM06005	Perform drop and upset forging	4	*
MEM06006	Repair springs	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM06008	Hammer forge complex shapes	4	*
MEM06009	Hand forge complex shapes	4	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07024	Operate and monitor machine and process	4	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07031	Perform complex metal spinning lathe operations	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*

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Unit code	Unit title	P	Pre req
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*
MEM08019	Electroplate protective finishes	6	*
MEM08020	Electroplate decorative finishes	6	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM10001	Erect structures	4	*
MEM10010	Install pipework and pipework assemblies	4	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11016	Order materials	2	*

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Unit code	Unit title	P	Pre req
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM12025	Use graphical techniques and perform simple statistical computations	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18003	Use tools for precision work	4	*
MEM18011	Shut down and isolate machines/equipment	2	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM24001B	Perform basic penetrant testing	2	*
MEM24003B	Perform basic magnetic particle testing	2	*
MEM24007B	Perform ultrasonic thickness testing	2	*
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	

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Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30319 Certificate III in Engineering - Fabrication Trade (Release 1).

Release 1. Supersedes and is equivalent to MEM30305 Certificate III in Engineering - Fabrication Trade.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30619 Certificate III in Jewellery Manufacture

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30605 Certificate III in Jewellery Manufacture.

Qualification Description

This qualification defines the skills and knowledge required of a jewellery manufacture tradesperson within the jewellery industry. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of jewellery manufacture work, including undertaking designing and making jewellery and small objects using a wide range of materials, including metals, stones, woods, plastics and fibres.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30619 Certificate III in Jewellery Manufacture, units of competency to a minimum value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A
- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

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Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a jewellery manufacture trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

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Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM05006	Perform brazing and/or silver soldering	2	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM08010	Manually finish/polish materials	6	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM15004	Perform inspection	2	*
MEM18003	Use tools for precision work	4	*
MEM19001	Perform jewellery metal casting	6	*
MEM19002	Prepare jewellery illustrations	4	*
MEM19003	Handle gem materials	2	*
MEM19005	Produce three-dimensional precision items	8	*
MEM19007	Perform gemstone setting	6	*
MEM19012	Produce jewellery wax model	4	*
MEM19013	Produce jewellery metal masters	4	*
MEM19014	Perform hand engraving	4	*
MEM19015	Perform jewellery enamelling	4	*
MEM19016	Construct jewellery components	4	*
MEM19017	Fabricate jewellery items	6	*

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Group B

Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*
MEM03006	Set assembly stations	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07005	Perform general machining	8	*
MEM07024	Operate and monitor machine and process	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07040	Set multistage integrated processes	6	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM09009	Create 2-D drawings using computer-aided design system	8	*
MEM09010	Create 3-D models using computer-aided design system	4	*
MEM11012	Purchase materials	6	*
MEM11016	Order materials	2	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM15003	Use improvement processes in team activities	4	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*

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Unit code	Unit title	P	Pre req
MEM19004	Handle and examine gemstone materials	6	*
MEM19008	Prepare jewellery designs	6	*
MEM19009	Perform investment procedures for lost wax casting process	1	*
MEM19010	Produce rubber moulds for lost wax casting process	2	*
MEM19011	Perform wax injection of moulds for lost wax casting process	2	*
MEM19018	Repair jewellery items	6	*
MEM19020	Fault find and maintain micro-mechanisms	4	*
MEM19021	Diagnose and service micro-mechanisms	6	*
MEM19022	Perform precision micro-mechanism diagnosis and servicing	6	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30619 Certificate III in Jewellery Manufacture (Release 1).

Release 1. Supersedes and is equivalent to MEM30605 Certificate III in Jewellery Manufacture.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30719 Certificate III in Marine Craft Construction

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30705 Certificate III in Marine Craft Construction.

Qualification Description

This qualification defines the skills and knowledge required of a marine craft construction tradesperson within the marine craft construction industry. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of marine craft construction work, including undertaking manufacturing and repairs of boats in fibre-reinforced plastics, timber and metal and marine/boat yard operations, fitting out of internal and external components of vessels and installation of engineering drive systems.

This qualification is designed to provide an industry recognised skills profile related to trade work as in Marine Craft Construction.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30719 Certificate III in Marine Craft Construction, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A
- elective units of competency to a maximum value of 23 points from Group B electives to bring the total value to 96 points.

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Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a marine craft construction trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*

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Unit code	Unit title	P	Pre req
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM04018	Perform general woodworking machine operations	4	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07024	Operate and monitor machine and process	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08014	Apply protective coatings (basic)	4	*
MEM09021	Interpret and produce drawings of curved 3-D shapes	4	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM25001	Apply fibre-reinforced materials	2	*
MEM25002	Form and integrate fibre-reinforced structures	4	*
MEM25003	Set up marine vessel structures	4	*
MEM25004	Fair and shape surfaces	2	*
MEM25005	Construct and assemble marine vessel timber components	8	*
MEM25006	Undertake marine sheathing operations	2	*
MEM25007	Maintain marine vessel surfaces	4	*

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Unit code	Unit title	P	Pre req
MEM25008	Repair marine vessel surfaces and structures	4	*
MEM25009	Form timber shapes using hot processes	2	*
MEM25010	Perform fitout procedures	4	*
MEM25011	Install marine systems	8	*
MEM25012	Install and test operations of marine auxiliary systems	6	*
MEM25013	Produce three-dimensional plugs/moulds	12	*
MEM25014	Perform marine slipping operations	2	*
MEM25015	Assemble and install equipment and accessories/ancillaries	2	*
MEM50002	Work safely on marine craft	1	*
MEM50003	Follow work procedures to maintain the marine environment	1	*
MEM50004	Maintain quality of environment by following marina codes	1	*
MEM50009	Safely operate a mechanically powered recreational boat	2	*

Group B

Unit code	Unit title	P	Pre req
MEM03002	Perform precision assembly	4	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05049	Perform routine gas tungsten arc welding	2	*

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Unit code	Unit title	P	Pre req
MEM05050	Perform routine gas metal arc welding	2	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09009	Create 2-D drawings using computer-aided design system	8	*
MEM10006	Install machine/plant	4	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18003	Use tools for precision work	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM26001	Lay up composites using open moulding techniques	6	*
MEM26006	Mark and cut out sheets for composite use	4	*
MEM26007	Select and use reinforcing appropriate for product	4	*
MEM26008	Select and use resin systems appropriate for product	4	*

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Unit code	Unit title	P	Pre req
MEM26009	Select and use cores and fillers appropriate for product	2	*
MEM26010	Store and handle composite materials	2	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30719 Certificate III in Marine Craft Construction (Release 1).

Release 1. Supersedes and is equivalent to MEM30705 Certificate III in Marine Craft Construction.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30819 Certificate III in Locksmithing

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30805 Certificate III in Locksmithing.

Qualification Description

This qualification defines the skills and knowledge required of a locksmithing tradesperson within the locksmithing industry. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of locksmithing work, including undertaking the repair, manufacture and installation of locking and security systems in domestic, automotive and industrial applications.

This qualification is designed to provide an industry recognised skills profile related to trade work as a locksmithing tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license or relate to regulatory requirements. Licensing and regulatory information is included in the relevant units of competence.

No other descriptor can be used.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30819 Certificate III in Locksmithing, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A
- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

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Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a locksmithing trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit Code	Unit Title	Points	Prereq
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on the job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

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Elective units of competency

Group A

Unit Code	Unit Title	Points	Prereq
MEM05007	Perform manual heating and thermal cutting	2	*
MEM20001	Produce keys	4	*
MEM20002	Assemble and test lock mechanisms	6	*
MEM20003	Install and upgrade locks and hardware	4	*
MEM20004	Gain entry	4	*
MEM20005	Install and maintain door control devices/systems	2	*
MEM20006	Maintain and service mechanical locking devices	6	*
MEM20007	Plan and prepare a masterkey system	4	*
MEM20008	Develop and implement a masterkey system	6	*
MEM20009	Gain entry and reinstate fire and security containers	4	*
MEM20010	Gain entry and reinstate automotive locking systems	4	*
MEM20011	Service and repair fire and security containers	6	*
MEM20012	Service and repair mechanical automotive locking systems	4	*
MEM20013	Service automotive transponder systems	2	*
MEM20014	Perform a site security survey	2	*

Group B

MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07024	Operate and monitor machine/process	4	*
MEM12001	Use comparison and basic measuring devices	2	*

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MEM12003	Perform precision mechanical measurement	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM16012	Interpret technical specifications and manuals	4	*
MEM18003	Use tools for precision work	4	*
CPPSEC2021A	Install security equipment and systems	4	
CPPSEC3036A	Program security equipment and system	2	
CPPSEC3037A	Test installed security equipment and system	2	
CPPSEC3038A	Commission and decommission security equipment and system	2	
CPPSEC3039A	Identify and diagnose electronic security equipment and system fault	2	
CPPSEC3041A	Maintain and service security equipment and system	4	
CPPSEC3047A	Provide estimate and quote on security system	4	
CPPSEC3049A	Modify and repair security equipment and system	4	

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30819 Certificate III in Locksmithing (Release 1).

Release 1. Supersedes and is equivalent to MEM30805 Certificate III in Locksmithing.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30919 Certificate III in Boating Services

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM30905 Certificate III in Boating Services.

Qualification Description

This qualification defines the skills and knowledge required of an employee working within the boating services industry.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of boating services work, including the general maintenance of structures, hulls, engines and on-board mechanical work. It also includes maintaining the marine environment.

This qualification should not be undertaken by people who are not employed or seeking employment in a boating services marine environment. It should not be undertaken by school students unless they are formally engaged in a Training Contract associated with an Australian Traineeship.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM30919 Certificate III in Boating Services, a total of nineteen (19) units of competency must be achieved, chosen as outlined below:

- six (6) core units of competency listed below
- a minimum of thirteen (13) elective units of competency from Group A.

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Up to four (4) appropriate elective units may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a boating services environment.

Prerequisites

Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	Prereq
MEM13015	Work safely and effectively in manufacturing and engineering	
MEM16006	Organise and communicate information	*
MEM50001	Classify recreational boating technologies and features	*
MEM50002	Work safely on marine craft	*
MEM50003	Follow work procedures to maintain the marine environment	*
MSMENV272	Participate in environmentally sustainable work practices	

Elective units of competency

Group A

Unit code	Unit title	Prereq
MEM04018	Perform general woodworking machine operations	*
MEM05003	Perform soft soldering	*
MEM05005	Carry out mechanical cutting	*
MEM05007	Perform manual heating and thermal cutting	*
MEM05012	Perform routine manual metal arc welding	*

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MEM05050	Perform routine gas metal arc welding	*
MEM09002	Interpret technical drawing	*
MEM11010	Operate mobile load shifting equipment	*
MEM11011	Undertake manual handling	*
MEM12006	Mark off/out (general engineering)	*
MEM12007	Mark off/out structural fabrications and shapes	*
MEM12023	Perform engineering measurements	*
MEM12024	Perform computations	*
MEM13003	Work safely with industrial chemicals and materials	*
MEM14006	Plan work activities	*
MEM18001	Use hand tools	*
MEM18002	Use power tools/hand held operations	*
MEM25001	Apply fibre-reinforced materials	*
MEM25004	Fair and shape surfaces	*
MEM25007	Maintain marine vessel surfaces	*
MEM50004	Maintain quality of environment by following marina codes	*
MEM50005	Refuel vessels	*
MEM50006	Check operational capability of marine craft	*
MEM50007	Check operational capability of sails and sail operating equipment	*
MEM50008	Carry out trip preparation and planning	*
MEM50009	Safely operate a mechanically powered recreational boat	*
MEM50010	Respond to boating emergencies and incidents	*
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tones and above)	

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TLILIC0003	Licence to operate a forklift truck	

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM30919 Certificate III in Boating Services (Release 1).

Release 1. Supersedes and is equivalent to MEM30905 Certificate III in Boating Services.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31019 Certificate III in Watch and Clock Service and Repair

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM31010 Certificate III in Watch and Clock Service and Repair.

Qualification Description

This qualification defines the skills and knowledge required of a watch and clock service and repair tradesperson within a variety of watch and clock service related industries, including retail stores, manufacturer service centres and specialist watch and clock service and repair businesses. This also includes self-employment.

This qualification has been specifically developed for apprentices in trades related to watch and clock servicing and repair and describes the skills and knowledge required to perform trade work in watch and clock service and repair.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of watch and clock service and repair work, including undertaking the disassembly, assembly, installation, adjustment, replacement, modification, testing, fault finding, and maintenance and service of watch and clock cases, mechanisms and other relevant components.

This qualification is designed to reflect the industry recognised skills profile associated with trade work as a watch and clock service and repair tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31019 Certificate III in Watch and Clock Service and Repair, units of competency to the value of 96 points must be achieved, chosen as outlined below:

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- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A
- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a watch and clock service and repair trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*

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Unit code	Unit title	P	Pre req
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM07005	Perform general machining	8	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM21001	Replace watch batteries, capacitors and bands	2	*
MEM21002	Perform watch movement exchange	2	*
MEM21003	Perform watch case servicing, repair and refurbishment	4	*
MEM21004	Clean watch and clock components	2	*
MEM21005	Diagnose faults in quartz watches	2	*
MEM21006	Service quartz watches	4	*
MEM21007	Service complex quartz watches	4	*
MEM21008	Service mechanical watches	4	*
MEM21009	Inspect, diagnose, adjust and repair mechanical watches	4	*
MEM21010	Service watch power generating systems	2	*
MEM21011	Service calendar and other dial indication mechanisms for watches	4	*

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Unit code	Unit title	P	Pre req
MEM21012	Service and repair mechanical watch oscillating systems	4	*
MEM21013	Service, test and adjust watch escapements	4	*
MEM21014	Service mechanical chronograph watches	6	*
MEM21015	Perform precision watch timing and adjustment	6	*
MEM21016	Install and set up clocks	2	*
MEM21017	Service and repair clock timepieces	6	*
MEM21018	Service clock escapements and oscillating systems	4	*
MEM21019	Service and repair clock striking mechanisms	4	*
MEM21020	Service and repair clock chiming mechanisms	6	*
MEM30025A	Analyse a simple electrical system circuit	4	*

Group B

Unit code	Unit title	P	Pre req
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM16012	Interpret technical specifications and manuals	4	*
MEM18003	Use tools for precision work	4	*
MEM21021	Restore clockwork mechanisms	6	*
MEM21022	Manufacture watch and clock components	6	*

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Unit code	Unit title	P	Pre req
MEM21023	Plan, set up and operate horological workshop or service centre	4	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31019 Certificate III in Watch and Clock Service and Repair (Release 1).

Release 1. Supersedes and is equivalent to MEM31010 Certificate III in Watch and Clock Service and Repair.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31119 Certificate III in Engineering - Composites Trade

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM31112 Certificate III in Engineering - Composites Trade.

Qualification Description

This qualification defines the skills and knowledge required of a composites tradesperson within the metal, engineering, manufacturing and associated industries, or other industries where composites tradespersons work. The qualification has been specifically developed to meet the needs of apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of composites work, including laying up composites, selecting, handling, using and storing materials and components, undertaking repairs and modifications, adjusting resin chemicals and selecting and using joining techniques.

This qualification is designed to provide an industry recognised skills profile related to working as a composites tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may relate to licensing or regulatory requirements. Local regulations should be checked.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31119 Certificate III in Engineering – Composites Trade, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 6 points from Group A
- elective units of competency to a minimum value of 34 points from Group B

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- elective units of competency to a maximum value of 23 points from Group C to bring the total value to 96 points.

Appropriate Group C elective units to the value of 8 points may be chosen from other MEM qualifications and other endorsed Training Packages where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a composites trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*

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Unit code	Unit title	P	Pre req
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM26001	Lay up composites using open moulding techniques	6	*
MEM26002	Lay up composites using vacuum closed moulding techniques	6	*
MEM26003	Lay up composites using pressure closed moulding techniques	6	*

Group B

Unit code	Unit title	P	Pre req
MEM26004	Make basic plugs for composites fabrication	3	*
MEM26005	Make basic moulds for composites fabrication	3	*
MEM26006	Mark and cut out sheets for composite use	4	*
MEM26007	Select and use reinforcing appropriate for product	4	*
MEM26008	Select and use resin systems appropriate for product	4	*
MEM26009	Select and use cores and fillers appropriate for product	2	*
MEM26010	Store and handle composite materials	2	*
MEM26011	Determine materials and techniques for a composite component or product	6	*
MEM26012	Record and trial work processes for one-off composite products	4	*

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Unit code	Unit title	P	Pre req
MEM26013	Select and use composite processes or systems appropriate for product	4	*
MEM26014	Adjust resin chemicals for current conditions	4	*
MEM26015	Select and apply repair techniques	6	*
MEM26016	Select and use joining techniques	6	*
MEM26017	Prepare composite or other substrate surfaces	4	*
MEM26018	Organise composite trials	4	*
MEM26019	Finish a composite product	4	*
MEM26020	Identify and interpret required standards for composites	2	*

Group C

Unit code	Unit title	P	Pre req
MEM11016	Order materials	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	

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Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31119 Certificate III in Engineering - Composites Trade (Release 1).

Release 1. Supersedes and is equivalent to MEM31112 Certificate III in Engineering - Composites Trade.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31219 Certificate III in Engineering - Industrial Electrician

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. Supersedes and is equivalent to MEM31215 Certificate III in Engineering - Industrial Electrician. Updated unit codes.

Qualification Description

This qualification provides competencies in the ability to select, set up and install, test, fault-find, repair and maintain electrical systems and equipment in buildings and industrial environments, including oil/gas installations, mine sites, processing plants and the like. The qualification covers the Essential Performance Capabilities as required by electrical regulators and includes a capstone assessment.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

Persons engaged in training towards this qualification must provide evidence of workplace experience to assist assessment against the units of competency and for any license application.

This qualification is designed to provide an industry recognised skills profile related to working as an Engineering Tradesperson – Industrial Electrician.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

This qualification is designed to support an application in each state and territory for a license to practise as an electrician. Other supporting documentation may be required. Local regulations should be checked for details.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31219 Certificate III in Engineering – Industrial Electrician, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 90 points) and
- elective units of competency to the value of 6 points, to bring the total value to 96 points.

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Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to individual units for details). All prerequisites have been included in the units listed.

Core units of competency

Select all of the units from this list

Unit code	Unit title	Points	*P
MEM10016	Terminate and test electrical wiring and accessories	4	*
MEM10018	Select cable types and sizes to suit loads and electrical installation environment	4	
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing	2	*
MEM10020	Install low voltage cabling and fit-off accessories, appliances and equipment	4	*
MEM10021	Inspect, test and verify electrical installations	4	*
MEM10022	Commission and decommission high and low voltage equipment or installations	2	
MEM10023	Design and connect control switching of circuits for building services and industrial equipment	4	*
MEM10024	Install and troubleshoot luminaires and ancillary equipment	2	*
MEM10025	Undertake a capstone assessment	1	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM13017	Apply safety practices, procedures and compliance standards associated with licensed electrical work	2	*
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on the-job-training	2	*

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MEM18001	Use hand tools	2	*
MEM18100	Fault-find, test and rectify AC machines and circuits	4	*
MEM18102	Fault-find, test and rectify single and three-phase transformers	4	*
MEM18103	Fault-find, test and rectify electrical circuits and equipment	4	*
MEM18104	Dismantle, replace and assemble electrical components and equipment	3	*
MSMENV272	Participate in environmentally sustainable work practices	3	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	2	
UEENEEE104A	Solve problems in d.c. circuits	5	*
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	4	*
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	5	*
UEENEEG102A	Solve problems in low voltage a.c. circuits	5	*

Elective units of competency

Select units to the value of 4 points from the list below or from any MEM Certificate III qualification.

Unit code	**Unit title**	**Points**	**P***
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM07032	Use workshop machines for basic operations	2	*
MEM13016	Work in hazardous areas	2	*
MEM18105	Disconnect and reconnect high voltage fixed wired	3	*

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	equipment		
MEM18106	Terminate communication and data cables	4	*
MEM18108	Troubleshoot analog and digital electronic equipment	4	*
MEM18109	Troubleshoot instrumentation systems and equipment	4	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31219 Certificate III in Engineering - Industrial Electrician (Release 1).

Release 1. Supersedes and is equivalent to MEM31215 Certificate III in Engineering - Industrial Electrician.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31319 Certificate III in Refrigeration and Air Conditioning

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Qualification Description

This qualification defines the skills and knowledge required of a heating, ventilation, air conditioning and refrigeration (HVAC/R) tradesperson within metal, engineering, manufacturing and associated industries. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range HVAC/R work, including assembling, installing, maintaining and repairing industrial, commercial and domestic air conditioning and refrigeration systems and equipment.

This qualification is designed to provide an industry recognised skills profile related to trade work as a refrigeration and air conditioning tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 and the Ozone Protection and Synthetic Gas Management Regulations 1995 apply to this qualification which incorporates national refrigerant handling licences and refrigerant trading authorisations. Refer to the Australian Refrigeration Council website for required units of competency to meet the refrigerant handling licence requirements. Licensing and regulatory information is included in the relevant units of competence.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31319 Certificate III in Refrigeration and Air Conditioning, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A

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- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a refrigeration and/or air conditioning trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

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Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM05003	Perform soft soldering	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM10009	Install refrigeration and air conditioning plant and equipment	4	*
MEM10010	Install pipework and pipework assemblies	4	*
MEM10013	Install split air conditioning systems and associated pipework	6	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM18046	Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c	10	*
MEM18048	Fault find and repair/rectify basic electrical circuits	12	*
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.	3	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM18083	Handle fluorocarbon refrigerants according to regulations	1	*
MEM18084	Commission and decommission split air conditioning systems	4	*
MEM18085	Install, service and repair domestic air conditioning and refrigeration appliances	6	*
MEM18086	Test, recover, evacuate and charge refrigeration systems	4	*
MEM18087	Service and repair domestic and light commercial refrigeration and air conditioning equipment	6	*

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Unit code	Unit title	P	Pre req
MEM18088	Maintain and repair commercial air conditioning systems and components	4	*
MEM18094	Service and repair commercial refrigeration	6	*
MEM18096	Maintain, repair/replace and adjust refrigerant flow controls and associated equipment	6	*

Group B

Unit code	Unit title	P	Pre req
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05005	Carry out mechanical cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07024	Operate and monitor machine and process	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM10003	Install and test electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c.	12	*
MEM10004	Enter and change programmable controller operational parameters	2	*
MEM10005	Commission programmable controller programs	4	*
MEM10011	Terminate and connect specialist cables	3	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*

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Unit code	Unit title	P	Pre req
MEM11005	Pick and process order	4	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11016	Order materials	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12004	Perform precision electrical/electronic measurement	4	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13007	Maintain water treatment systems for cooling towers	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM15004	Perform inspection	2	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM16013	Operate in a self-directed team	2	*
MEM18003	Use tools for precision work	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18011	Shut down and isolate machines/equipment	2	*
MEM18045	Fault find and repair electrical equipment/components up to 250 volts single phase supply	4	*
MEM18050	Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.	3	*
MEM18051	Fault find and repair/rectify complex electrical circuits	6	*

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Unit code	Unit title	P	Pre req
MEM18089	Maintain and repair central air handling systems	6	*
MEM18090	Maintain and repair industrial refrigeration systems and components	6	*
MEM18091	Maintain and repair multistage, cascade and/or ultra-cold industrial refrigeration systems	4	*
MEM18092	Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls	6	*
MEM18093	Maintain and repair integrated industrial refrigeration and/or large air handling system controls	8	*
MEM18095	Maintain and repair cooling towers/evaporative condensers and associated equipment	4	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31319 Certificate III in Refrigeration and Air Conditioning (Release 1).

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31419 Certificate III in Engineering - Fixed and Mobile Plant Mechanic

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Qualification Description

This qualification defines the skills and knowledge required of an engineering tradesperson - mechanical specialising in diesel fitting and plant mechanics within metal, engineering, manufacturing and associated industries. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of trade work including manufacturing, assembly and commissioning of mobile and stationary plant, servicing, diagnosis and rectification of faults, condition monitoring, and preventative maintenance.

This qualification is designed to provide an industry recognised skills profile related to trade work as a fixed and/or mobile plant mechanic.

Assessment of some units of competency must, where indicated, include evidence of the candidate’s performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license or relate to regulatory requirements. Licensing and regulatory information is included in the relevant units of competence.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31419 Certificate III in Engineering – Fixed and Mobile Plant Mechanic, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- all core units of competency listed below (totalling 63 points)

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- units to a value of 33 points from Group A electives

Appropriate Group A elective units to the value of 8 points may be chosen from other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a fixed and/or mobile plant mechanic trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units

Unit code	**Unit title**	**P**	**Pre-req**
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits	8	*
MEM27016	Diagnose and maintain electronic controlling systems on	4	*

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Unit code	Unit title	P	Pre-req
	mobile and stationary plant		
MEM27017	Maintain, fault find and rectify hydraulic systems for mobile plant	4	*
MEM27019	Diagnose, repair and replace diesel engines in stationary and mobile plant	5	*
MEM27020	Apply knowledge of large combustion engine operations to service and maintenance tasks	2	*
MEM27023	Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment	4	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Group A Elective Units

Unit code	Unit title	P	Pre-req
MEM05001	Perform manual soldering/desoldering – electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM07005	Perform general machining	8	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM12002	Perform electrical/electronic measurement	2	*

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Unit code	Unit title	P	Pre-req
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM18003	Use tools for precision work	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18018	Maintain pneumatic system components	4	*
MEM18019	Maintain pneumatic systems	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18021	Maintain hydraulic systems	4	*
MEM18022	Maintain fluid power controls	8	*
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.	3	*
MEM18050	Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.	3	*
MEM27001	Maintain and repair stationary and mobile plant engine cooling systems	2	*
MEM27002	Test and repair compression ignition systems	4	*

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Unit code	Unit title	P	Pre-req
MEM27003	Overhaul engine fuel system components	8	*
MEM27004	Maintain and repair engine lubrication systems	2	*
MEM27005	Tune diesel engines	4	*
MEM27007	Diagnose and rectify low voltage starting systems	2	*
MEM27008	Maintain induction, exhaust and emission control systems	4	*
MEM27009	Diagnose and rectify braking systems	6	*
MEM27010	Diagnose and rectify low voltage charging systems	2	*
MEM27011	Maintain track type undercarriage on mobile plant	4	*
MEM27012	Maintain mobile plant suspension systems	4	*
MEM27013	Maintain steering systems	4	*
MEM27014	Diagnose and rectify automatic transmissions	8	*
MEM27015	Diagnose and rectify drive line and final drives	4	*
MEM27021	Maintain, fault find and repair stationary plant gas turbine engines	6	*
MEM27022	Maintain, fault find and repair traction drive mechanics	4	*
MEM27026	Service and repair mobile plant air conditioning systems	4	*
MEM27028	Diagnose and rectify manual transmissions	4	*
MEM27029	Maintain wheels and tyres	2	*
MEM27030	Perform engine bottom-end overhaul	4	*

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Unit code	Unit title	P	Pre-req
MEM27031	Perform engine top-end overhaul	8	*
MEM27032	Service combustion engines	2	*
CPPFES2027A	Inspect, test and maintain non-gaseous pre-engineered fire-suppression systems	2	
CPPFES3042A	Install and commission pre-engineered fire-suppression systems	2	
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
TLILIC0003	Licence to operate a forklift truck	0	
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31419 Certificate III in Engineering - Fixed and Mobile Plant Mechanic (Release 1).

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31519 Certificate III in Engineering - Toolmaking Trade

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Qualification Description

This qualification defines the skills and knowledge required of an engineering tradesperson - toolmaking within metal, engineering, manufacturing and associated industries. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of toolmaking trade work, including the manufacture, modification and maintenance of tooling.

This qualification is designed to provide an industry recognised skills profile related to trade work as a toolmaking tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license or relate to regulatory requirements. Licensing and regulatory information is included in the relevant units of competence.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31519 Certificate III in Engineering – Toolmaking Trade, units of competency to the value of 108 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 82 points)
- elective units of competency to a minimum value of 8 points from Group A
- elective units of competency to a maximum value of 18 points from Group B to bring the total value of the qualification to 108 points.

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Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a toolmaking trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Pre req
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*
MEM07008	Perform grinding operations	4	*
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment	4	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*

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Unit code	Unit title	P	Pre req
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MEM18003	Use tools for precision work	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18015	Maintain tools and dies	4	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A - Toolmaking Trade Specialisation

Unit code	Unit title	P	Pre req
MEM07018	Write basic NC and CNC programs	4	*
MEM07022	Program CNC wire cut machines	2	*
MEM18014	Manufacture press tools and gauges	8	*
MEM18097	Manufacture cavity dies	8	*

Group B

Unit code	Unit title	P	Pre req

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Unit code	Unit title	P	Pre req
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05041	Weld using flame powder spraying	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM06003	Carry out heat treatment	6	*
MEM06004	Select heat treatment processes and test finished product	6	*
MEM07002	Perform precision shaping/planing/slotting operations	4	*
MEM07009	Perform precision jig boring operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07011	Perform complex milling operations	4	*
MEM07012	Perform complex grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07021	Perform complex lathe operations	4	*

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Unit code	Unit title	P	Pre req
MEM09003	Prepare basic engineering drawing	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12020	Set and operate coordinate measuring machines	2	*
MEM12021	Program coordinate measuring machines	4	*
MEM12022	Program coordinate measuring machines (advanced)	2	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM15001	Perform basic statistical quality control	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*

Qualification Mapping Information

Release 2. Supersedes and equivalent to MEM31519 Certificate III in Engineering - Toolmaking Trade (Release 1).

Release 1. New qualification. Supersedes but is not equivalent to MEM30205 Certificate III in Engineering – Mechanical Trade.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM31719 Certificate III in Engineering - Casting and Moulding Trade

Modification History

Release 2. Mandatory training contract pathway added.

Release 1. New qualification. Supersedes but is not equivalent to MEM30305 Certificate III in Engineering – Fabrication Trade.

Qualification Description

This qualification defines the skills and knowledge required of an engineering tradesperson - casting and moulding within the metal, engineering, manufacturing and associated industries. The qualification has been specifically developed for apprentices in the above trade.

This qualification must be undertaken through a Training Contract or through formal trade recognition assessment processes.

The skills associated with this qualification are intended to apply to a wide range of casting and moulding work, including producing sand moulds by hand or using moulding machines, pouring and trimming castings and operating and monitoring melting furnaces.

This qualification is designed to provide an industry recognised skills profile related to trade work as a casting and moulding tradesperson.

Assessment of some units of competency must, where indicated, include evidence of the candidate's performance in a functioning workplace where there is a sufficient range of appropriate tasks and materials to cover the scope of application of those units. All outcomes must reflect the standard of performance inherent in the job.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license or relate to regulatory requirements. Licensing and regulatory information is included in the relevant units of competence.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM31719 Certificate III in Engineering – Casting and Moulding Trade, units of competency to the value of 96 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 40 points from Group A

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- elective units of competency to a maximum value of 23 points from Group B to bring the total value to 96 points.

Appropriate Group B elective units to the value of 8 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Certificate III. Only select units that would be suitable for occupational outcomes in a casting and moulding trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the qualification

Core units of competency

Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*

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Unit code	Unit title	P	Pre req
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM04001	Operate melting furnaces	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*
MEM04007	Pour molten metal	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM04019	Perform refractory installation and repair	4	*
MEM04024	Produce moulds and cores by hand	4	*
MEM04025	Produce moulds and cores by hand (advanced)	12	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07024	Operate and monitor machine and process	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*

Group B

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Unit code	Unit title	P	Pre req
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM09011	Apply basic engineering design concepts	6	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11016	Order materials	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM15004	Perform inspection	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*

Qualification Mapping Information

Release 2. Supersedes and is equivalent to MEM31719 Certificate III in Engineering – Casting and Moulding Trade (Release 1).

Release 1. New qualification. Supersedes but is not equivalent to MEM30305 Certificate III in Engineering – Fabrication Trade.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM40119 Certificate IV in Engineering

Modification History

Release 1. Supersedes and is equivalent to MEM40105 Certificate IV in Engineering

Qualification Description

This qualification defines the skills and knowledge required for a higher engineering tradesperson within metal, engineering, manufacturing and associated industries.

The skills associated with this qualification are intended to apply to a wide range of engineering work undertaken in the fields of refrigeration and air conditioning, casting and moulding, computer numerically controlled (CNC) programming, fluid power, heavy fabrication, instrumentation, maintenance, plant mechanics, marine electronics, mechatronics, patternmaking, robotics, toolmaking, welding and watch and clock services and repair, including post-trade work.

It provides the skills and knowledge for a person to understand and implement quality control techniques, exercise good interpersonal and communications skills, work from complex instructions and procedures, exercise discretion within the scope of responsibility, perform work under limited supervision either individually or in a team environment, be responsible for assuring the quality of their own work, provide trade guidance and assistance as part of a work team, perform non-trade tasks which are incidental or peripheral to the primary tasks and facilitate the completion of the whole task, inspect products and/or materials for conformity with established operational standards, operate lifting equipment incidental to their work and assists in the provision of training in conjunction with supervisors and trainers.

This qualification may be accessed by direct entry. While there is no qualification entry requirement, it is assumed that the learner is either already a tradesperson with access to structured on and off-the-job training or is an apprentice under an Australian Apprenticeship arrangement. It should not be used as a pre-employment or pre-apprenticeship program. It is specifically designed to cover the skills and knowledge required of workers employed as Engineering/Manufacturing Tradesperson – Special Class Level II as defined in the Manufacturing and Associated Industries and Occupations Award.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license. Licensing information is included in the relevant units of competence.

The following additional descriptors are approved for use with this qualification:

- Casting and Moulding
- CNC Programming
- Fluid Power
- Boilermaking
- Instrumentation
- Maintenance
- Fixed and Mobile Plant Mechanic

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- Mechatronics
- Patternmaking
- Refrigeration and Air Conditioning
- Marine Craft Construction
- Robotics
- Sheet Metal
- Toolmaking
- Watch and Clock Service and Repair
- Welding

No other descriptor can be used.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM40119 Certificate IV in Engineering units of competency to a value of 132 points must be achieved, chosen as outlined below:

- core units of competency listed below (totalling 33 points)
- elective units of competency to a minimum value of 12 points from Group A
- elective units of competency to a maximum value of 87 points from Group B to bring the total value to 132 points.

Appropriate Group B elective units to the value of 14 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion in Certificate III and Certificate IV qualifications. Only select units that would be suitable for occupational outcomes in a higher engineering trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

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Unit code	Unit title	P	Pre req
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Pre req
MEM04020	Supervise individual ferrous melting and casting operation	4	*
MEM04021	Supervise individual non-ferrous melting and casting operation	4	*
MEM04022	Examine appropriateness of methoding for mould design	4	*
MEM04023	Undertake prescribed tests on foundry-related materials	4	*
MEM05024	Perform welding supervision	12	*
MEM05025	Perform welding/fabrication inspection	12	*

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Unit code	Unit title	P	Pre req
MEM05026	Apply welding principles	4	*
MEM05042	Perform welds to code standards using flux core arc welding process	6	*
MEM05043	Perform welds to code standards using gas metal arc welding process	6	*
MEM05044	Perform welds to code standards using gas tungsten arc welding process	6	*
MEM05045	Perform pipe welds to code standards using manual metal arc welding process	6	*
MEM05046	Perform welds to code standards using manual metal arc welding process	6	*
MEM05053	Set and edit computer controlled thermal cutting machines	4	*
MEM05054	Write basic NC/CNC programs for thermal cutting machines	4	*
MEM05058	Perform welds to code standards using oxy fuel gas welding process	6	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07018	Write basic NC and CNC programs	4	*
MEM07019	Program NC and CNC machining centre	2	*
MEM07020	Program multiple spindle and multiple axis NC and CNC machining centre	2	*
MEM07022	Program CNC wire cut machines	2	*
MEM07023	Program and set up CNC manufacturing cell	6	*
MEM07039	Write programs for industrial robots	4	*
MEM09004	Perform electrical or electronic detail drafting	8	*
MEM09006	Perform advanced engineering detail drafting	4	*
MEM09007	Perform advanced mechanical detail drafting	4	*
MEM09008	Perform advanced structural detail drafting	4	*
MEM09009	Create 2-D drawings using computer-aided design system	8	*

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Unit code	Unit title	P	Pre req
MEM09010	Create 3-D models using computer-aided design system	4	*
MEM09023	Create 3-D code files using computer-aided manufacturing system	6	*
MEM10007	Modify control systems	6	*
MEM10008	Undertake commissioning procedures for plant and/or equipment	4	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12004	Perform precision electrical/electronic measurement	4	*
MEM12005	Calibrate measuring equipment	6	*
MEM12025	Use graphical techniques and perform simple statistical computations	2	*
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment	4	*
MEM14001	Schedule material deliveries	8	*
MEM14002	Undertake basic process planning	8	*
MEM14003	Undertake production scheduling	8	*
MEM15007	Conduct product and/or process capability studies	6	*
MEM15008	Perform advanced statistical quality control	2	*
MEM15010	Perform laboratory procedures	8	*
MEM15011	Exercise external quality assurance	6	*
MEM15012	Maintain/supervise the application of quality procedures	4	*
MEM15015B	Examine trading practices	5	*
MEM15016B	Inspect pre-packed articles	8	*
MEM15017B	Use and maintain reference standards	3	*
MEM15018B	Investigate consumer complaints	6	*
MEM15019B	Conduct a field inspection	12	*
MEM15020C	Perform verification/certification or in-service inspection	12	*

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Unit code	Unit title	P	Pre req
MEM15021C	Conduct audits of servicing licensees and public weighbridge licensees	4	*
MEM15022B	Verify reference standards	8	*
MEM16001	Give formal presentations and take part in meetings	2	*
MEM16003	Provide advanced customer service	2	*
MEM16009	Research and analyse engineering information	2	*
MEM16010	Write reports	2	*
MEM16011	Communicate with individuals and small groups	2	*
MEM16012	Interpret technical specifications and manuals	4	*
MEM16013	Operate in a self-directed team	2	*
MEM16014	Report technical information	2	*
MEM17001	Assist in development and deliver training in the workplace	2	*
MEM17002	Conduct workplace assessment	2	*
MEM18010	Perform equipment condition monitoring and recording	4	*
MEM18011	Shut down and isolate machines/equipment	2	*
MEM18016	Analyse plant and equipment condition monitoring results	4	*
MEM18017	Modify mechanical systems and equipment	8	*
MEM18019	Maintain pneumatic systems	4	*
MEM18021	Maintain hydraulic systems	4	*
MEM18022	Maintain fluid power controls	8	*
MEM18023	Modify fluid power system operation	8	*
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.	3	*
MEM18050	Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.	3	*

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Unit code	Unit title	P	Pre req
MEM18053	Modify fluid power control systems	6	*
MEM18054	Fault find, test and calibrate instrumentation systems and equipment	8	*
MEM18056	Diagnose and repair analog equipment and components	10	*
MEM18058	Modify electronic equipment	4	*
MEM18059	Modify electronic systems	4	*
MEM18060	Maintain, repair control instrumentation - single and multiple loop control systems	8	*
MEM18061	Maintain/calibrate complex control systems	8	*
MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements	8	*
MEM18065	Diagnose and repair digital equipment and components	10	*
MEM18066	Diagnose and repair microprocessor-based equipment	6	*
MEM18067	Tune control loops - multi controller or multi element systems	6	*
MEM18069	Maintain, repair instrumentation process control analysers	6	*
MEM18091	Maintain and repair multistage, cascade and/or ultra-cold industrial refrigeration systems	4	*
MEM18092	Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls	6	*
MEM18093	Maintain and repair integrated industrial refrigeration and/or large air handling system controls	8	*
MEM20008	Develop and implement a masterkey system	6	*
MEM20011	Service and repair fire and security containers	6	*
MEM20012	Service and repair mechanical automotive locking systems	4	*
MEM20013	Service automotive transponder systems	2	*
MEM21018	Service clock escapements and oscillating systems	4	*
MEM21019	Service and repair clock striking mechanisms	4	*

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Unit code	Unit title	P	Pre req
MEM21020	Service and repair clock chiming mechanisms	6	*
MEM21021	Restore clockwork mechanisms	6	*
MEM21022	Manufacture watch and clock components	6	*
MEM21023	Plan, set up and operate horological workshop or service centre	4	*
MEM24002B	Perform penetrant testing	4	*
MEM24004B	Perform magnetic particle testing	4	*
MEM24006B	Perform eddy current testing	6	*
MEM24008B	Perform ultrasonic testing	6	*
MEM24010B	Perform radiographic testing	6	*
MEM24011B	Establish non-destructive tests	12	*
MEM24012C	Apply metallurgy principles	4	*
MEM25008	Repair marine vessel surfaces and structures	4	*
MEM25013	Produce three-dimensional plugs/moulds	12	*
MEM27018	Test, diagnose and rectify mobile and stationary plant external monitoring and control systems	4	*
MEM27024	Diagnose and rectify mobile plant hydrostatic systems	4	*
MEM27027	Install or modify mobile plant air conditioning systems	4	*
MSATCM304A	Interpret basic binary phase diagrams	4	

Group B

Unit code	Unit title	P	Pre req
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*

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Unit code	Unit title	P	Pre req
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM03005	Rework and repair (electrical/electronic production)	8	*
MEM03006	Set assembly stations	2	*
MEM04001	Operate melting furnaces	4	*
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*
MEM04007	Pour molten metal	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM04010	Develop and manufacture wood patterns	20	*
MEM04011	Produce polymer patterns	8	*
MEM04012	Assemble plated patterns	8	*
MEM04013	Develop and manufacture polystyrene patterns	2	*
MEM04014	Develop and manufacture production patterns	8	*
MEM04015	Develop and manufacture vacuum forming moulds and associated equipment	6	*
MEM04016	Develop and manufacture precision models	6	*
MEM04017	Develop and manufacture gear, conveyor screw and propeller patterns	4	*
MEM04018	Perform general woodworking machine operations	4	*
MEM04019	Perform refractory installation and repair	4	*
MEM04024	Produce moulds and cores by hand	4	*

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Unit code	Unit title	P	Pre req
MEM04025	Produce moulds and cores by hand (advanced)	12	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05013	Perform manual production welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*

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Unit code	Unit title	P	Pre req
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05038	Perform advanced geometric development - cylindrical/rectangular	2	*
MEM05039	Perform advanced geometric development - conical	2	*
MEM05040	Perform advanced geometric development - transitions	4	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM06001	Perform hand forging	4	*
MEM06002	Perform hammer forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06004	Select heat treatment processes and test finished product	6	*
MEM06005	Perform drop and upset forging	4	*
MEM06006	Repair springs	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM06008	Hammer forge complex shapes	4	*

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Unit code	Unit title	P	Pre req
MEM06009	Hand forge complex shapes	4	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07002	Perform precision shaping/planing/slotting operations	4	*
MEM07003	Perform routine machine setting	4	*
MEM07004	Perform complex machine setting	8	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*
MEM07008	Perform grinding operations	4	*
MEM07009	Perform precision jig boring operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07011	Perform complex milling operations	4	*
MEM07012	Perform complex grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07021	Perform complex lathe operations	4	*
MEM07024	Operate and monitor machine and process	4	*
MEM07025	Perform advanced machine and process operation	6	*
MEM07026	Perform advanced plastic processing	6	*
MEM07027	Perform advanced press operations	6	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07029	Perform routine sharpening and maintenance of production tools and	4	*

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Unit code	Unit title	P	Pre req
	cutters		
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07031	Perform complex metal spinning lathe operations	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07033	Operate and monitor basic boiler	6	*
MEM07040	Set multistage integrated processes	6	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*

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Unit code	Unit title	P	Pre req
MEM08019	Electroplate protective finishes	6	*
MEM08020	Electroplate decorative finishes	6	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09005	Perform basic engineering detail drafting	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM09021	Interpret and produce drawings of curved 3-D shapes	4	*
MEM09022	Create 2-D code files using computer-aided manufacturing system	4	*
MEM10001	Erect structures	4	*
MEM10002	Terminate and connect electrical wiring	3	*
MEM10004	Enter and change programmable controller operational parameters	2	*
MEM10005	Commission programmable controller programs	4	*
MEM10006	Install machine/plant	4	*
MEM10009	Install refrigeration and air conditioning plant and equipment	4	*
MEM10010	Install pipework and pipework assemblies	4	*
MEM10011	Terminate and connect specialist cables	3	*
MEM10013	Install split air conditioning systems and associated pipework	6	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11002	Erect/dismantle intermediate scaffolding and equipment	4	*
MEM11003	Coordinate erection/dismantling of complex scaffolding/equipment	4	*
MEM11004	Undertake dogging	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*
MEM11007	Administer inventory procedures	4	*

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Unit code	Unit title	P	Pre req
MEM11008	Package materials (stores and warehouse)	2	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11012	Purchase materials	6	*
MEM11013	Undertake warehouse receival process	4	*
MEM11014	Undertake warehouse dispatch process	4	*
MEM11015	Manage warehouse inventory system	6	*
MEM11016	Order materials	2	*
MEM11017	Organise and lead stocktakes	4	*
MEM11018	Organise and maintain warehouse stock receival and dispatch system	6	*
MEM11019	Undertake tool store procedures	4	*
MEM11020	Perform advanced warehouse computer operations	4	*
MEM11021	Perform advanced operation of load shifting equipment	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12020	Set and operate coordinate measuring machines	2	*
MEM12021	Program coordinate measuring machines	4	*
MEM12022	Program coordinate measuring machines (advanced)	2	*
MEM13001	Perform emergency first aid	1	*

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Unit code	Unit title	P	Pre req
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM13006	Collect and evaluate work health and safety data for an enterprise or section of an enterprise	4	*
MEM13007	Maintain water treatment systems for cooling towers	2	*
MEM13010	Supervise work health and safety in an industrial work environment	4	*
MEM13013	Work safely with ionizing radiation	4	*
MEM15001	Perform basic statistical quality control	2	*
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM15005	Select and control inspection processes and procedures	4	*
MEM16002	Conduct formal interviews and negotiations	4	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18003	Use tools for precision work	4	*
MEM18004	Maintain and overhaul mechanical equipment	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies	4	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*

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Unit code	Unit title	P	Pre req
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18014	Manufacture press tools and gauges	8	*
MEM18015	Maintain tools and dies	4	*
MEM18018	Maintain pneumatic system components	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18045	Fault find and repair electrical equipment/components up to 250 volts single phase supply	4	*
MEM18046	Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.	10	*
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM18057	Maintain/service analog/digital electronic equipment	6	*
MEM18063	Terminate signal and data cables	4	*
MEM18064	Maintain instrumentation system components	6	*
MEM18071	Connect and disconnect fluid conveying system components	2	*
MEM18072	Manufacture fluid conveying conductor assemblies	4	*
MEM18083	Handle fluorocarbon refrigerants according to regulations	1	*
MEM18084	Commission and decommission split air conditioning systems	4	*
MEM18085	Install, service and repair domestic air conditioning and refrigeration appliances	6	*
MEM18086	Test, recover, evacuate and charge refrigeration systems	4	*
MEM18087	Service and repair domestic and light commercial refrigeration and air conditioning equipment	6	*
MEM18088	Maintain and repair commercial air conditioning systems and components	4	*
MEM18089	Maintain and repair central air handling systems	6	*

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Unit code	Unit title	P	Pre req
MEM18090	Maintain and repair industrial refrigeration systems and components	6	*
MEM18094	Service and repair commercial refrigeration	6	*
MEM18095	Maintain and repair cooling towers/evaporative condensers and associated equipment	4	*
MEM18096	Maintain, repair/replace and adjust refrigerant flow controls and associated equipment	6	*
MEM18097	Manufacture cavity dies	8	*
MEM18098	Prepare to perform work associated with fuel system installation and servicing	2	*
MEM19001	Perform jewellery metal casting	6	*
MEM19002	Prepare jewellery illustrations	4	*
MEM19003	Handle gem materials	2	*
MEM19004	Handle and examine gemstone materials	6	*
MEM19005	Produce three-dimensional precision items	8	*
MEM19006	Replace watch batteries	1	*
MEM19007	Perform gemstone setting	6	*
MEM19009	Perform investment procedures for lost wax casting process	1	*
MEM19010	Produce rubber moulds for lost wax casting process	2	*
MEM19011	Perform wax injection of moulds for lost wax casting process	2	*
MEM19012	Produce jewellery wax model	4	*
MEM19014	Perform hand engraving	4	*
MEM19015	Perform jewellery enamelling	4	*
MEM19016	Construct jewellery components	4	*
MEM19017	Fabricate jewellery items	6	*
MEM19020	Fault find and maintain micro-mechanisms	4	*

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Unit code	Unit title	P	Pre req
MEM19021	Diagnose and service micro-mechanisms	6	*
MEM20001	Produce keys	4	*
MEM20002	Assemble and test lock mechanisms	6	*
MEM20003	Install and upgrade locks and hardware	4	*
MEM20004	Gain entry	4	*
MEM20005	Install and maintain door control devices/systems	2	*
MEM20006	Maintain and service mechanical locking devices	6	*
MEM20007	Plan and prepare a masterkey system	4	*
MEM20009	Gain entry and reinstate fire and security containers	4	*
MEM20010	Gain entry and reinstate automotive locking systems	4	*
MEM20014	Perform a site security survey	2	*
MEM21001	Replace watch batteries, capacitors and bands	2	*
MEM21002	Perform watch movement exchange	2	*
MEM21003	Perform watch case servicing, repair and refurbishment	4	*
MEM21004	Clean watch and clock components	2	*
MEM21005	Diagnose faults in quartz watches	2	*
MEM21006	Service quartz watches	4	*
MEM21007	Service complex quartz watches	4	*
MEM21008	Service mechanical watches	4	*
MEM21009	Inspect, diagnose, adjust and repair mechanical watches	4	*
MEM21010	Service watch power generating systems	2	*
MEM21011	Service calendar and other dial indication mechanisms for watches	4	*
MEM21012	Service and repair mechanical watch oscillating systems	4	*

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Unit code	Unit title	P	Pre req
MEM21013	Service, test and adjust watch escapements	4	*
MEM21014	Service mechanical chronograph watches	6	*
MEM21015	Perform precision watch timing and adjustment	6	*
MEM21016	Install and set up clocks	2	*
MEM21017	Service and repair clock timepieces	6	*
MEM24001B	Perform basic penetrant testing	2	*
MEM24003B	Perform basic magnetic particle testing	2	*
MEM24005B	Perform basic eddy current testing	2	*
MEM24007B	Perform ultrasonic thickness testing	2	*
MEM24009B	Perform basic radiographic testing	2	*
MEM25001	Apply fibre-reinforced materials	2	*
MEM25002	Form and integrate fibre-reinforced structures	4	*
MEM25003	Set up marine vessel structures	4	*
MEM25004	Fair and shape surfaces	2	*
MEM25005	Construct and assemble marine vessel timber components	8	*
MEM25006	Undertake marine sheathing operations	2	*
MEM25007	Maintain marine vessel surfaces	4	*
MEM25009	Form timber shapes using hot processes	2	*
MEM25010	Perform fitout procedures	4	*
MEM25011	Install marine systems	8	*
MEM25012	Install and test operations of marine auxiliary systems	6	*
MEM25014	Perform marine slipping operations	2	*
MEM25015	Assemble and install equipment and accessories/ancillaries	2	*

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Unit code	Unit title	P	Pre req
MEM27001	Maintain and repair stationary and mobile plant engine cooling systems	2	*
MEM27002	Test and repair compression ignition systems	4	*
MEM27003	Overhaul engine fuel system components	4	*
MEM27004	Maintain and repair engine lubrication systems	2	*
MEM27005	Tune diesel engines	4	*
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits	8	*
MEM27007	Diagnose and rectify low voltage starting systems	2	*
MEM27008	Maintain induction, exhaust and emission control systems	4	*
MEM27009	Diagnose and rectify braking systems	6	*
MEM27010	Diagnose and rectify low voltage charging systems	2	*
MEM27011	Maintain track type undercarriage on mobile plant	4	*
MEM27012	Maintain mobile plant suspension systems	4	*
MEM27013	Maintain steering systems	4	*
MEM27014	Diagnose and rectify automatic transmissions	8	*
MEM27015	Diagnose and rectify drive line and final drives	4	*
MEM27016	Diagnose and maintain electronic controlling systems on mobile and stationary plant	4	*
MEM27017	Maintain, fault find and rectify hydraulic systems for mobile plant	4	*
MEM27019	Diagnose, repair and replace diesel engines in stationary and mobile plant	5	*
MEM27020	Apply knowledge of large combustion engine operations to service and maintenance tasks	2	*
MEM27021	Maintain, fault find and repair stationary plant gas turbine engines	6	*
MEM27022	Maintain, fault find and repair traction drive mechanics	4	*

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Unit code	Unit title	P	Pre req
MEM27023	Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment	4	*
MEM27026	Service and repair mobile plant air conditioning systems	4	*
MEM27029	Maintain wheels and tyres	2	*
MEM27030	Perform engine bottom-end overhaul	4	*
MEM27031	Perform engine top-end overhaul	8	*
MEM27032	Service combustion engines	2	*
MEM50002	Work safely on marine craft	1	*
MEM50003	Follow work procedures to maintain the marine environment	1	*
MEM50004	Maintain quality of environment by following marina codes	1	*
MEM50009	Safely operate a mechanically powered recreational boat	2	*
MSMENV472	Implement and monitor environmentally sustainable work practices	4	
CPPFES2027A	Inspect, test and maintain non-gaseous pre-engineered fire-suppression systems	2	
CPPFES3042A	Install and commission pre-engineered fire-suppression systems	2	
CPPSEC2021A	Install security equipment and system	4	
CPPSEC3036A	Program security equipment and system	2	
CPPSEC3037A	Test installed security equipment and system	2	
CPPSEC3038A	Commission and decommission security equipment and system	2	
CPPSEC3039A	Identify and diagnose electronic security equipment and system fault	2	
CPPSEC3041A	Maintain and service security equipment and system	4	
CPPSEC3047A	Provide estimate and quote	4	
CPPSEC3049A	Modify and repair security equipment and system	4	
PMBPROD291	Operate resin infusion moulding equipment	2	

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Unit code	Unit title	P	Pre req
PMBPROD294	Operate resin transfer moulding equipment	2	
PMBPROD298	Operate equipment using pre-preg material	2	
PMBPROD391	Produce composites using resin infusion	4	*
PMBPROD394	Produce composites using resin transfer moulding	4	*
PMBPROD398	Produce composites using pre-pregs	4	*
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	
TLILIC0003	Licence to operate a forklift truck	0	

Qualification Mapping Information

Release 1. Supersedes and is equivalent to MEM40105 Certificate IV in Engineering

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50119 Diploma of Engineering – Advanced Trade

Modification History

Release 1. Supersedes and is equivalent to MEM50105 Diploma of Engineering – Advanced Trade

Qualification Description

This qualification defines the skills and knowledge required for employment as an Advanced Engineering Tradesperson - Level II within the metal, engineering, manufacturing and associated industries or at equivalent levels in other industries where engineering tradespersons work. The qualification has been specifically developed to meet the needs of apprentices in an engineering trade who choose to study at a higher level during their apprenticeship, or for people who are existing engineering tradespersons.

It provides the skills and knowledge for a person to undertake quality control, exercise good interpersonal and communications skills, work from complex instructions and procedures, provide technical guidance or assistance within the scope of responsibility, prepare reports of a technical nature on specific tasks or assignments, exercise broad discretion within the scope of responsibility, perform work under limited supervision either individually or in a team environment, be responsible for assuring the quality of their own work, provide trade guidance and assistance as part of a work team, perform non-trade tasks which are incidental or peripheral to the primary tasks and facilitate the completion of the whole task, inspect products and/or materials for conformity with established operational standards, operate lifting equipment incidental to their work and assists in the provision of training in conjunction with supervisors and trainers.

This qualification may be accessed by direct entry. While there is no qualification entry requirement it is assumed that the learner is either already a tradesperson with access to structured on and off-the-job training or is an apprentice under an Australian Apprenticeship arrangement. It should not be used as a pre-employment or pre-apprenticeship program.

For pathways information, refer to the MEM R2 Companion Volume Implementation Guide.

No licensing, legislative or certification requirements apply to this qualification at the time of publication. However, in some jurisdictions units in this qualification may require a license. Licensing information is included in the relevant units of competence.

Entry Requirements

There are no entry requirements for this qualification.

Packaging Rules

To be awarded the MEM50119 Diploma of Engineering – Advanced Trade, units of competency to the value of 156 points must be achieved, chosen as outlined below:

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- core units of competency listed below (totalling 49 points)
- elective units of competency to a maximum value of 87 points from Group A
- elective units of competency to a minimum value of 8 points from Group C
- elective units of competency from Group B to bring the total value to 156 points.

Appropriate Group A elective units to the value of 18 points may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion in Certificate III, Certificate IV and Diploma qualifications. Only select units that would be suitable for occupational outcomes in an advanced engineering trade environment.

Registered Training Organisations (RTOs) must seek a determination from the industry parties in respect of the allocation of points values for units of competency drawn from other Training Packages or accredited courses. Determination of points requests are to be submitted to the industry parties through Innovation and Business Skills Australia (IBSA) Manufacturing. Refer to the MEM Companion Volume Implementation Guide for information on determination of unit points values.

Prerequisites

Points associated with prerequisites count towards the total. Units with prerequisite requirements are marked with an asterisk (refer to the individual units for details). All prerequisites are included in the units listed.

Core units of competency

Unit code	Unit title	P	Prereq
MEM09002	Interpret technical drawing	4	*
MEM11011	Undertake manual handling	2	*
MEM12023	Perform engineering measurements	5	*
MEM12024	Perform computations	3	*
MEM12025	Use graphical techniques and perform simple statistical computations	2	*
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment	4	*
MEM13015	Work safely and effectively in manufacturing and engineering	2	
MEM14006	Plan work activities	4	*
MEM16006	Organise and communicate information	2	*
MEM16008	Interact with computing technology	2	*

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Unit code	Unit title	P	Prereq
MEM16009	Research and analyse engineering information	2	*
MEM16011	Communicate with individuals and small groups	2	*
MEM16012	Interpret technical specifications and manuals	4	*
MEM16014	Report technical information	2	*
MEM17003	Assist in the provision of on-the-job training	2	*
MEM18001	Use hand tools	2	*
MEM18002	Use power tools/hand held operations	2	*
MSMENV272	Participate in environmentally sustainable work practices	3	

Elective units of competency

Group A

Unit code	Unit title	P	Prereq
MEM03001	Perform manual production assembly	4	*
MEM03002	Perform precision assembly	4	*
MEM03003	Perform sheet and plate assembly	4	*
MEM03004	Perform electronic/electrical assembly (production)	8	*
MEM03005	Rework and repair (electrical/electronic production)	8	*
MEM03006	Set assembly stations	2	*
MEM04001	Operate melting furnaces	4	*
MEM04002	Perform gravity die casting	2	*
MEM04003	Operate pressure die casting machine	4	*
MEM04004	Prepare and mix sand for metal moulding	4	*
MEM04006	Operate sand moulding and core making machines	8	*

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Unit code	Unit title	P	Prereq
MEM04007	Pour molten metal	4	*
MEM04008	Fettle and trim metal castings/forgings	4	*
MEM04010	Develop and manufacture wood patterns	20	*
MEM04011	Produce polymer patterns	8	*
MEM04012	Assemble plated patterns	8	*
MEM04013	Develop and manufacture polystyrene patterns	2	*
MEM04014	Develop and manufacture production patterns	8	*
MEM04015	Develop and manufacture vacuum forming moulds and associated equipment	6	*
MEM04016	Develop and manufacture precision models	6	*
MEM04017	Develop and manufacture gear, conveyor screw and propeller patterns	4	*
MEM04018	Perform general woodworking machine operations	4	*
MEM04019	Perform refractory installation and repair	4	*
MEM04024	Produce moulds and cores by hand	4	*
MEM04025	Produce moulds and cores by hand (advanced)	12	*
MEM05001	Perform manual soldering/desoldering - electrical/electronic components	4	*
MEM05002	Perform high reliability soldering and desoldering	4	*
MEM05003	Perform soft soldering	2	*
MEM05004	Perform routine oxy fuel gas welding	2	*
MEM05005	Carry out mechanical cutting	2	*
MEM05006	Perform brazing and/or silver soldering	2	*
MEM05007	Perform manual heating and thermal cutting	2	*
MEM05008	Perform advanced manual thermal cutting, gouging and shaping	2	*

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Unit code	Unit title	P	Prereq
MEM05009	Perform automated thermal cutting	2	*
MEM05010	Apply fabrication, forming and shaping techniques	8	*
MEM05011	Assemble fabricated components	8	*
MEM05012	Perform routine manual metal arc welding	2	*
MEM05013	Perform manual production welding	2	*
MEM05014	Monitor quality of production welding/fabrications	2	*
MEM05015	Weld using manual metal arc welding process	4	*
MEM05016	Perform advanced welding using manual metal arc welding process	4	*
MEM05017	Weld using gas metal arc welding process	4	*
MEM05018	Perform advanced welding using gas metal arc welding process	4	*
MEM05019	Weld using gas tungsten arc welding process	4	*
MEM05020	Perform advanced welding using gas tungsten arc welding process	4	*
MEM05022	Perform advanced welding using oxy acetylene welding process	6	*
MEM05023	Weld using submerged arc welding process	4	*
MEM05036	Repair, replace and/or modify fabrications	4	*
MEM05037	Perform geometric development	6	*
MEM05038	Perform advanced geometric development - cylindrical/rectangular	2	*
MEM05039	Perform advanced geometric development - conical	2	*
MEM05040	Perform advanced geometric development - transitions	4	*
MEM05041	Weld using flame powder spraying	4	*
MEM05047	Weld using flux core arc welding process	4	*
MEM05048	Perform advanced welding using flux core arc welding process	4	*

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Unit code	Unit title	P	Prereq
MEM05049	Perform routine gas tungsten arc welding	2	*
MEM05050	Perform routine gas metal arc welding	2	*
MEM05051	Select welding processes	2	*
MEM05052	Apply safe welding practices	4	*
MEM05055	Weld using oxy fuel gas welding process	4	*
MEM05056	Perform routine flux core arc welding	2	*
MEM05057	Perform routine submerged arc welding	2	*
MEM06001	Perform hand forging	4	*
MEM06002	Perform hammer forging	4	*
MEM06003	Carry out heat treatment	6	*
MEM06004	Select heat treatment processes and test finished product	6	*
MEM06005	Perform drop and upset forging	4	*
MEM06006	Repair springs	4	*
MEM06007	Perform basic incidental heat/quenching, tempering and annealing	2	*
MEM06008	Hammer forge complex shapes	4	*
MEM06009	Hand forge complex shapes	4	*
MEM07001	Perform operational maintenance of machines/equipment	2	*
MEM07002	Perform precision shaping/planing/slotting operations	4	*
MEM07003	Perform routine machine setting	4	*
MEM07004	Perform complex machine setting	8	*
MEM07005	Perform general machining	8	*
MEM07006	Perform lathe operations	4	*
MEM07007	Perform milling operations	4	*

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Unit code	Unit title	P	Prereq
MEM07008	Perform grinding operations	4	*
MEM07009	Perform precision jig boring operations	4	*
MEM07010	Perform tool and cutter grinding operations	4	*
MEM07011	Perform complex milling operations	4	*
MEM07012	Perform complex grinding operations	4	*
MEM07013	Perform machining operations using horizontal and vertical boring machines	4	*
MEM07014	Perform electro-discharge machining (EDM) operations	4	*
MEM07015	Set computer controlled machines and processes	2	*
MEM07021	Perform complex lathe operations	4	*
MEM07024	Operate and monitor machine and process	4	*
MEM07025	Perform advanced machine and process operation	6	*
MEM07026	Perform advanced plastic processing	6	*
MEM07027	Perform advanced press operations	6	*
MEM07028	Operate computer controlled machines and processes	2	*
MEM07029	Perform routine sharpening and maintenance of production tools and cutters	4	*
MEM07030	Perform basic metal spinning lathe operations	8	*
MEM07031	Perform complex metal spinning lathe operations	4	*
MEM07032	Use workshop machines for basic operations	2	*
MEM07033	Operate and monitor basic boiler	6	*
MEM07040	Set multistage integrated processes	6	*
MEM08001	Perform wire, jig and barrel load/unload work	4	*
MEM08002	Pre-treat work for subsequent surface coating	4	*
MEM08003	Perform electroplating operations	6	*

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Unit code	Unit title	P	Prereq
MEM08004	Finish work using wet, dry and vapour deposition methods	4	*
MEM08005	Prepare and produce specialised coatings	4	*
MEM08006	Produce clear and/or coloured and/or sealed anodised films on aluminium	2	*
MEM08007	Control surface finish production and finished product quality	4	*
MEM08008	Operate and control surface finishing waste treatment process	3	*
MEM08009	Make up solutions	2	*
MEM08010	Manually finish/polish materials	6	*
MEM08011	Prepare surfaces using solvents and/or mechanical means	2	*
MEM08012	Prepare surfaces by abrasive blasting (basic)	4	*
MEM08013	Prepare surfaces by abrasive blasting (advanced)	4	*
MEM08014	Apply protective coatings (basic)	4	*
MEM08015	Apply protective coatings (advanced)	4	*
MEM08016	Control blast coating by-products, materials and emissions	1	*
MEM08018	Electroplate engineering coatings	6	*
MEM08019	Electroplate protective finishes	6	*
MEM08020	Electroplate decorative finishes	6	*
MEM09003	Prepare basic engineering drawing	8	*
MEM09005	Perform basic engineering detail drafting	8	*
MEM09011	Apply basic engineering design concepts	6	*
MEM09021	Interpret and produce drawings of curved 3-D shapes	4	*
MEM09022	Create 2-D code files using computer-aided manufacturing system	4	*
MEM10001	Erect structures	4	*
MEM10002	Terminate and connect electrical wiring	3	*

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Unit code	Unit title	P	Prereq
MEM10004	Enter and change programmable controller operational parameters	2	*
MEM10005	Commission programmable controller programs	4	*
MEM10006	Install machine/plant	4	*
MEM10009	Install refrigeration and air conditioning plant and equipment	4	*
MEM10010	Install pipework and pipework assemblies	4	*
MEM10011	Terminate and connect specialist cables	3	*
MEM10013	Install split air conditioning systems and associated pipework	6	*
MEM11001	Erect/dismantle scaffolding and equipment	4	*
MEM11002	Erect/dismantle intermediate scaffolding and equipment	4	*
MEM11003	Coordinate erection/dismantling of complex scaffolding/equipment	4	*
MEM11004	Undertake dogging	4	*
MEM11005	Pick and process order	4	*
MEM11006	Perform production packaging	2	*
MEM11007	Administer inventory procedures	4	*
MEM11008	Package materials (stores and warehouse)	2	*
MEM11009	Handle/move bulk fluids/gases	4	*
MEM11010	Operate mobile load shifting equipment	4	*
MEM11012	Purchase materials	6	*
MEM11013	Undertake warehouse receival process	4	*
MEM11014	Undertake warehouse dispatch process	4	*
MEM11015	Manage warehouse inventory system	6	*
MEM11016	Order materials	2	*
MEM11017	Organise and lead stocktakes	4	*

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Unit code	Unit title	P	Prereq
MEM11018	Organise and maintain warehouse stock receival and dispatch system	6	*
MEM11019	Undertake tool store procedures	4	*
MEM11020	Perform advanced warehouse computer operations	4	*
MEM11021	Perform advanced operation of load shifting equipment	2	*
MEM11022	Operate fixed/moveable load shifting equipment	4	*
MEM12001	Use comparison and basic measuring devices	2	*
MEM12002	Perform electrical/electronic measurement	2	*
MEM12006	Mark off/out (general engineering)	4	*
MEM12007	Mark off/out structural fabrications and shapes	4	*
MEM12019	Measure components using coordinate measuring machines	4	*
MEM12020	Set and operate coordinate measuring machines	2	*
MEM12021	Program coordinate measuring machines	4	*
MEM12022	Program coordinate measuring machines (advanced)	2	*
MEM13001	Perform emergency first aid	1	*
MEM13002	Undertake work health and safety activities in the workplace	3	*
MEM13003	Work safely with industrial chemicals and materials	2	*
MEM13004	Work safely with molten metals/glass	2	*
MEM13006	Collect and evaluate work health and safety data for an enterprise or section of an enterprise	4	*
MEM13007	Maintain water treatment systems for cooling towers	2	*
MEM13010	Supervise work health and safety in an industrial work environment	4	*
MEM13013	Work safely with ionizing radiation	4	*
MEM15001	Perform basic statistical quality control	2	*

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Unit code	Unit title	P	Prereq
MEM15003	Use improvement processes in team activities	4	*
MEM15004	Perform inspection	2	*
MEM15005	Select and control inspection processes and procedures	4	*
MEM16002	Conduct formal interviews and negotiations	4	*
MEM16004	Perform internal/external customer service	2	*
MEM16005	Operate as a team member to conduct manufacturing, engineering or related activities	2	*
MEM18003	Use tools for precision work	4	*
MEM18004	Maintain and overhaul mechanical equipment	4	*
MEM18005	Perform fault diagnosis, installation and removal of bearings	4	*
MEM18006	Perform precision fitting of engineering components	6	*
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies	4	*
MEM18008	Balance equipment	2	*
MEM18009	Perform precision levelling and alignment of machines and engineering components	4	*
MEM18012	Perform installation and removal of mechanical seals	2	*
MEM18013	Perform gland packing	2	*
MEM18014	Manufacture press tools and gauges	8	*
MEM18015	Maintain tools and dies	4	*
MEM18018	Maintain pneumatic system components	4	*
MEM18020	Maintain hydraulic system components	4	*
MEM18045	Fault find and repair electrical equipment/components up to 250 volts single phase supply	4	*
MEM18046	Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.	10	*

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Unit code	Unit title	P	Prereq
MEM18055	Dismantle, replace and assemble engineering components	3	*
MEM18057	Maintain/service analog/digital electronic equipment	6	*
MEM18063	Terminate signal and data cables	4	*
MEM18064	Maintain instrumentation system components	6	*
MEM18071	Connect and disconnect fluid conveying system components	2	*
MEM18072	Manufacture fluid conveying conductor assemblies	4	*
MEM18083	Handle fluorocarbon refrigerants according to regulations	1	*
MEM18084	Commission and decommission split air conditioning systems	4	*
MEM18085	Install, service and repair domestic air conditioning and refrigeration appliances	6	*
MEM18086	Test, recover, evacuate and charge refrigeration systems	4	*
MEM18087	Service and repair domestic and light commercial refrigeration and air conditioning equipment	6	*
MEM18088	Maintain and repair commercial air conditioning systems and components	4	*
MEM18089	Maintain and repair central air handling systems	6	*
MEM18090	Maintain and repair industrial refrigeration systems and components	6	*
MEM18094	Service and repair commercial refrigeration	6	*
MEM18095	Maintain and repair cooling towers/evaporative condensers and associated equipment	4	*
MEM18096	Maintain, repair/replace and adjust refrigerant flow controls and associated equipment	6	*
MEM18097	Manufacture cavity dies	8	*
MEM18098	Prepare to perform work associated with fuel system installation and servicing	2	*
MEM19001	Perform jewellery metal casting	6	*

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Unit code	Unit title	P	Prereq
MEM19002	Prepare jewellery illustrations	4	*
MEM19003	Handle gem materials	2	*
MEM19004	Handle and examine gemstone materials	6	*
MEM19005	Produce three-dimensional precision items	8	*
MEM19006	Replace watch batteries	1	*
MEM19007	Perform gemstone setting	6	*
MEM19009	Perform investment procedures for lost wax casting process	1	*
MEM19010	Produce rubber moulds for lost wax casting process	2	*
MEM19011	Perform wax injection of moulds for lost wax casting process	2	*
MEM19012	Produce jewellery wax model	4	*
MEM19014	Perform hand engraving	4	*
MEM19015	Perform jewellery enamelling	4	*
MEM19016	Construct jewellery components	4	*
MEM19017	Fabricate jewellery items	6	*
MEM19020	Fault find and maintain micro-mechanisms	4	*
MEM19021	Diagnose and service micro-mechanisms	6	*
MEM20001	Produce keys	4	*
MEM20002	Assemble and test lock mechanisms	6	*
MEM20003	Install and upgrade locks and hardware	4	*
MEM20004	Gain entry	4	*
MEM20005	Install and maintain door control devices/systems	2	*
MEM20006	Maintain and service mechanical locking devices	6	*
MEM20007	Plan and prepare a masterkey system	4	*
MEM20009	Gain entry and reinstate fire and security containers	4	*

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Unit code	Unit title	P	Prereq
MEM20010	Gain entry and reinstate automotive locking systems	4	*
MEM20014	Perform a site security survey	2	*
MEM21001	Replace watch batteries, capacitors and bands	2	*
MEM21002	Perform watch movement exchange	2	*
MEM21003	Perform watch case servicing, repair and refurbishment	4	*
MEM21004	Clean watch and clock components	2	*
MEM21005	Diagnose faults in quartz watches	2	*
MEM21006	Service quartz watches	4	*
MEM21007	Service complex quartz watches	4	*
MEM21008	Service mechanical watches	4	*
MEM21009	Inspect, diagnose, adjust and repair mechanical watches	4	*
MEM21010	Service watch power generating systems	2	*
MEM21011	Service calendar and other dial indication mechanisms for watches	4	*
MEM21012	Service and repair mechanical watch oscillating systems	4	*
MEM21013	Service, test and adjust watch escapements	4	*
MEM21014	Service mechanical chronograph watches	6	*
MEM21015	Perform precision watch timing and adjustment	6	*
MEM21016	Install and set up clocks	2	*
MEM21017	Service and repair clock timepieces	6	*
MEM24001B	Perform basic penetrant testing	2	*
MEM24003B	Perform basic magnetic particle testing	2	*
MEM24005B	Perform basic eddy current testing	2	*
MEM24007B	Perform ultrasonic thickness testing	2	*

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Unit code	Unit title	P	Prereq
MEM24009B	Perform basic radiographic testing	2	*
MEM25001	Apply fibre-reinforced materials	2	*
MEM25002	Form and integrate fibre-reinforced structures	4	*
MEM25003	Set up marine vessel structures	4	*
MEM25004	Fair and shape surfaces	2	*
MEM25005	Construct and assemble marine vessel timber components	8	*
MEM25006	Undertake marine sheathing operations	2	*
MEM25007	Maintain marine vessel surfaces	4	*
MEM25009	Form timber shapes using hot processes	2	*
MEM25010	Perform fitout procedures	4	*
MEM25011	Install marine systems	8	*
MEM25012	Install and test operations of marine auxiliary systems	6	*
MEM25014	Perform marine slipping operations	2	*
MEM25015	Assemble and install equipment and accessories/ancillaries	2	*
MEM27001	Maintain and repair stationary and mobile plant engine cooling systems	2	*
MEM27002	Test and repair compression ignition systems	4	*
MEM27003	Overhaul engine fuel system components	8	*
MEM27004	Maintain and repair engine lubrication systems	2	*
MEM27005	Tune diesel engines	4	*
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits	8	*
MEM27007	Diagnose and rectify low voltage starting systems	2	*
MEM27008	Maintain induction, exhaust and emission control systems	4	*
MEM27009	Diagnose and rectify braking systems	6	*

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Unit code	Unit title	P	Prereq
MEM27010	Diagnose and rectify low voltage charging systems	2	*
MEM27011	Maintain track type undercarriage on mobile plant	4	*
MEM27012	Maintain mobile plant suspension systems	4	*
MEM27013	Maintain steering systems	4	*
MEM27014	Diagnose and rectify automatic transmissions	8	*
MEM27015	Diagnose and rectify drive line and final drives	4	*
MEM27016	Diagnose and maintain electronic controlling systems on mobile and stationary plant	4	*
MEM27017	Maintain, fault find and rectify hydraulic systems for mobile plant	4	*
MEM27019	Diagnose, repair and replace diesel engines in stationary and mobile plant	5	*
MEM27020	Apply knowledge of large combustion engine operations to service and maintenance tasks	2	*
MEM27021	Maintain, fault find and repair stationary plant gas turbine engines	6	*
MEM27022	Maintain, fault find and repair traction drive mechanics	4	*
MEM27023	Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment	4	*
MEM27026	Service and repair mobile plant air conditioning systems	4	*
MEM27029	Maintain wheels and tyres	2	*
MEM27030	Perform engine bottom-end overhaul	4	*
MEM27031	Perform engine top-end overhaul	8	*
MEM27032	Service combustion engines	2	*
MEM50002	Work safely on marine craft	1	*
MEM50003	Follow work procedures to maintain the marine environment	1	*
MEM50004	Maintain quality of environment by following marina codes	1	*

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Unit code	Unit title	P	Prereq
MEM50009	Safely operate a mechanically powered recreational boat	2	*
CPPFES2027A	Inspect, test and maintain non-gaseous pre-engineered fire-suppression systems	2	
CPPFES3042A	Install and commission pre-engineered fire-suppression systems	2	
CPPSEC2021A	Install security equipment and system	4	
CPPSEC3036A	Program security equipment and system	2	
CPPSEC3037A	Test installed security equipment and system	2	
CPPSEC3038A	Commission and decommission security equipment and system	2	
CPPSEC3039A	Identify and diagnose electronic security equipment and system fault	2	
CPPSEC3041A	Maintain and service security equipment and system	4	
CPPSEC3047A	Provide estimate and quote	4	
CPPSEC3049A	Modify and repair security equipment and system	4	
PMBPROD291	Operate resin infusion moulding equipment	2	
PMBPROD294	Operate resin transfer moulding equipment	2	
PMBPROD298	Operate equipment using pre-preg material	2	
PMBPROD391	Produce composites using resin infusion	4	*
PMBPROD394	Produce composites using resin transfer moulding	4	*
PMBPROD398	Produce composites using pre-pregs	4	*
TLILIC0002	Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)	1	
TLILIC0003	Licence to operate a forklift truck	0	

Group B

Unit code	Unit title	P	Prereq

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Unit code	Unit title	P	Prereq
MEM04020	Supervise individual ferrous melting and casting operation	4	*
MEM04021	Supervise individual non-ferrous melting and casting operation	4	*
MEM04022	Examine appropriateness of methoding for mould design	4	*
MEM04023	Undertake prescribed tests on foundry-related materials	4	*
MEM05026	Apply welding principles	4	*
MEM05042	Perform welds to code standards using flux core arc welding process	6	*
MEM05043	Perform welds to code standards using gas metal arc welding process	6	*
MEM05044	Perform welds to code standards using gas tungsten arc welding process	6	*
MEM05045	Perform pipe welds to code standards using manual metal arc welding process	6	*
MEM05046	Perform welds to code standards using manual metal arc welding process	6	*
MEM05053	Set and edit computer controlled thermal cutting machines	4	*
MEM05054	Write basic NC/CNC programs for thermal cutting machines	4	*
MEM05058	Perform welds to code standards using oxy fuel gas welding process	6	*
MEM07016	Set and edit computer controlled machines and processes	4	*
MEM07018	Write basic NC and CNC programs	4	*
MEM07019	Program NC and CNC machining centre	2	*
MEM07020	Program multiple spindle and multiple axis NC and CNC machining centre	2	*
MEM07022	Program CNC wire cut machines	2	*
MEM12003	Perform precision mechanical measurement	2	*
MEM12004	Perform precision electrical/electronic measurement	4	*

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Unit code	Unit title	P	Prereq
MEM18011	Shut down and isolate machines/equipment	2	*
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.	3	*
MEM18050	Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.	3	*
MEM18054	Fault find, test and calibrate instrumentation systems and equipment	8	*
MEM18056	Diagnose and repair analog equipment and components	10	*
MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements	8	*
MEM18065	Diagnose and repair digital equipment and components	10	*
MEM18092	Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls	6	*
MEM27018	Test, diagnose and rectify mobile and stationary plant external monitoring and control systems	4	*
MEM27024	Diagnose and rectify mobile plant hydrostatic systems	4	*
MSATCM304A	Interpret basic binary phase diagrams	4	*

Group C

Unit code	Unit title	P	Prereq
MEM05024	Perform welding supervision	12	*
MEM05025	Perform welding/fabrication inspection	12	*
MEM07023	Program and set up CNC manufacturing cell	6	*
MEM07039	Write programs for industrial robots	4	*
MEM09004	Perform electrical or electronic detail drafting	8	*
MEM09006	Perform advanced engineering detail drafting	4	*

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Unit code	Unit title	P	Prereq
MEM09007	Perform advanced mechanical detail drafting	4	*
MEM09008	Perform advanced structural detail drafting	4	*
MEM09009	Create 2-D drawings using computer-aided design system	8	*
MEM09010	Create 3-D models using computer-aided design system	4	*
MEM09023	Create 3-D code files using computer-aided manufacturing system	6	*
MEM10007	Modify control systems	6	*
MEM10008	Undertake commissioning procedures for plant and/or equipment	4	*
MEM12005	Calibrate measuring equipment	6	*
MEM14001	Schedule material deliveries	8	*
MEM14002	Undertake basic process planning	8	*
MEM14003	Undertake production scheduling	8	*
MEM15007	Conduct product and/or process capability studies	6	*
MEM15008	Perform advanced statistical quality control	2	*
MEM15010	Perform laboratory procedures	8	*
MEM15011	Exercise external quality assurance	6	*
MEM15012	Maintain/supervise the application of quality procedures	4	*
MEM15015B	Examine trading practices	5	*
MEM15016B	Inspect pre-packed articles	8	*
MEM15017B	Use and maintain reference standards	3	*
MEM15018B	Investigate consumer complaints	6	*
MEM15019B	Conduct a field inspection	12	*
MEM15020C	Perform verification/certification or in-service inspection	12	*
MEM15021C	Conduct audits of servicing licensees and public weighbridge licensees	4	*

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Unit code	Unit title	P	Prereq
MEM15022B	Verify reference standards	8	*
MEM16001	Give formal presentations and take part in meetings	2	*
MEM16003	Provide advanced customer service	2	*
MEM16010	Write reports	2	*
MEM16013	Operate in a self-directed team	2	*
MEM17001	Assist in development and deliver training in the workplace	2	*
MEM17002	Conduct workplace assessment	2	*
MEM18010	Perform equipment condition monitoring and recording	4	*
MEM18016	Analyse plant and equipment condition monitoring results	4	*
MEM18017	Modify mechanical systems and equipment	8	*
MEM18019	Maintain pneumatic systems	4	*
MEM18021	Maintain hydraulic systems	4	*
MEM18022	Maintain fluid power controls	8	*
MEM18023	Modify fluid power system operation	8	*
MEM18053	Modify fluid power control systems	6	*
MEM18058	Modify electronic equipment	4	*
MEM18059	Modify electronic systems	4	*
MEM18060	Maintain, repair control instrumentation – single and multiple loop control systems	8	*
MEM18061	Maintain/calibrate complex control systems	8	*
MEM18066	Diagnose and repair microprocessor-based equipment	6	*
MEM18067	Tune control loops – multi controller or multi element systems	6	*
MEM18069	Maintain, repair instrumentation process control analysers	6	*
MEM18091	Maintain and repair multistage, cascade and/or ultra-cold industrial refrigeration systems	4	*

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Unit code	Unit title	P	Prereq
MEM18093	Maintain and repair integrated industrial refrigeration and/or large air handling system controls	8	*
MEM20008	Develop and implement a masterkey system	6	*
MEM20011	Service and repair fire and security containers	6	*
MEM20012	Service and repair mechanical automotive locking systems	4	*
MEM20013	Service automotive transponder systems	2	*
MEM21018	Service clock escapements and oscillating systems	4	*
MEM21019	Service and repair clock striking mechanisms	4	*
MEM21020	Service and repair clock chiming mechanisms	6	*
MEM21021	Restore clockwork mechanisms	6	*
MEM21022	Manufacture watch and clock components	6	*
MEM21023	Plan, set up and operate horological workshop or service centre	4	*
MEM24002B	Perform penetrant testing	4	*
MEM24004B	Perform magnetic particle testing	4	*
MEM24006B	Perform eddy current testing	6	*
MEM24008B	Perform ultrasonic testing	6	*
MEM24010B	Perform radiographic testing	6	*
MEM24011B	Establish non-destructive tests	12	*
MEM24012C	Apply metallurgy principles	4	
MEM25008	Repair marine vessel surfaces and structures	4	*
MEM25013	Produce three-dimensional plugs/moulds	12	*
MEM27025	Maintain, diagnose and rectify fluid power controls in mobile equipment	6	*
MEM27027	Install or modify mobile plant air conditioning systems	4	*
MEM27033	Perform advanced equipment testing and diagnostics on mobile	8	*

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Unit code	Unit title	P	Prereq
	plant and equipment		
MEM30012A	Apply mathematical techniques in a manufacturing engineering or related environment	4	
MSMENV472	Implement and monitor environmentally sustainable work practices	4	

Qualification Mapping Information

Release 1. Supersedes and is equivalent to MEM50105 Diploma of Engineering – Advanced Trade

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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CPCCLDG3001A Licence to perform dogging

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit specifies the outcomes required to perform slinging techniques, including the selection and inspection of lifting gear and/or the directing of the crane operator in the movement of the load when the load is out of view of the crane/ operator for licensing purposes.

Application of the Unit

Application of the unit

This unit covers the scope of work to demonstrate competency in the application of slinging techniques, selection and inspection of lifting gear and/or the directing of the crane/ operator in the movement of the load.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units Nil

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. ***Site information*** is obtained and related to the task. 1.2. ***Hazard*** s and potential hazards associated with the slinging and directing of loads are identified. 1.3. ***Hazard control measures*** consistent with ***appropriate standards*** are identified to ensure the safety of personnel and equipment. 1.4. The weight, dimensions and centre of gravity of the load are identified and assessed. 1.5. Suitable lifting/slinging points on the load are identified. 1.6. Appropriate ***lifting equipment*** needs are assessed. 1.7. Appropriate ***communication methods*** are assessed with ***crane***/ operators and other ***appropriate personnel***. 1.8. Manufacturer's specifications/information is obtained for special loads where necessary.
2. Select and inspect equipment.	2.1. Lifting equipment appropriate to the task is selected. 2.2. Lifting equipment is inspected for serviceability. 2.3. Damaged or excessively worn lifting equipment is identified, labelled and rejected.

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Appropriate communication methods for the crane/operator and appropriate personnel are selected. 2.5. Appropriate ***communication equipment*** is selected and its serviceability is checked. 2.6. Appropriate ***personal protective equipment*** (PPE) is selected and checked.
3. Prepare site and equipment.	3.1. Hazard prevention/control measures are applied consistent with appropriate standards to ensure the safety of personnel and equipment. 3.2. Appropriate slinging method is selected. 3.3. Lifting equipment is prepared and assembled where appropriate. 3.4. Load destination is prepared.
4. Perform task.	4.1. Lifting equipment is attached and secured to the lifting hook using appropriate techniques. 4.2. Lifting hook is positioned over the load centre of gravity. 4.3. Lifting equipment is attached and secured to the load in an appropriate manner. 4.4. Tag line is attached and secured where appropriate. 4.5. Test lift is conducted to ensure security of load. 4.6. Load is moved maintaining stability and control at all times. 4.7. Appropriate communication methods and ***communication signals*** are applied to safely coordinate the load movement both within sight and out-of-sight of crane operator. 4.8. The load is landed to ensure that it is stable and secure from movement. 4.9. Lifting equipment is removed or disconnected from load and prepared for next task or storage.
5. Shut down job and clean up.	5.1. Unserviceable lifting equipment inspected and rejected. 5.2. ***Defective equipment*** is isolated and tagged. 5.3. Lifting equipment is stored in accordance with procedures and appropriate standards. 5.4. Hazard prevention/control measures are removed where appropriate. 5.5. Excess materials from the work area are removed (where applicable).

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ELEMENT	PERFORMANCE CRITERIA
	5.6. Defects are reported and recorded according to procedures and appropriate action is taken.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- communication techniques in the workplace including whistles, hand signals and use of fixed channel two-way radios
- communication skills at a level sufficient to communicate with other site personnel
- calculate rated capacity of lifting equipment
- apply different methods for making temporary connections to loads using fibre and synthetic ropes
- ability to interpret rated capacity and working load limit tags
- hazard identification and control
- slinging techniques
- selection and inspection of lifting equipment
- directing crane operators in the moving of loads in a safe manner, using a slewing crane
- inspection and care of a wide range of lifting equipment to appropriate Australian Standards and/or manufacturer's specifications.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- basic knowledge of types of cranes and their functions
- Commonwealth, state or territory OHS legislation, standards and codes of practice relevant to the full range of techniques for undertaking dogging activities
- load stability and safety factors in line with manufacturer's specifications
- types of lifting equipment and slinging techniques for use, and their limitations and performance in a wide range of conditions (including but not limited to slings, beams, accessories, clamps, work-boxes, bins and pallets)
- understanding of the hierarchy of control.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work.

State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment of this unit which have been endorsed by the national body responsible for OHS matters.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- comply with Commonwealth, state or territory OHS legislation, standards relevant to safe dogging and crane operations.
- communicate and work safely with others in the work area.
- apply Hazard prevention and control measures consistent with appropriate standards.
- apply to move loads in conjunction with cranes including, the reading of tags, slinging, loading, directing and landing loads with a slewing mobile crane with a telescopic boom and a winch, in and out of sight of the crane/ operator, moving four loads of varying shapes, sizes and weights.
- use fibre and/or synthetic rope as tag lines, and connecting to loads using clove hitch, rolling hitch, bowline and single sheetbend.
- conduct pre and post operational checks of the lifting equipment.

Context of and specific resources for assessment

- Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the national OHS endorsed Assessment Instrument
- Assessment of performance must be

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EVIDENCE GUIDE

	undertaken either in the workplace or in a realistically simulated workplace setting
	• Assessors must ensure that the assessment in the workplace is organised through a workplace supervisor to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace
	• Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints
	• Assessment is to comply with the requirements of any relevant Standards or operating procedures for dogging activities
	• Applicants must have access to:
	  • personal protective equipment (PPE) for the purpose of the performance assessment.
	  • four different loads as prescribed in the endorsed assessment instrument
	  • lifting and associated equipment
	  • suitable slewing crane
	  • communication equipment (eg. fixed channel, two-way radios) as applicable.

Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instrument. This Instrument provides instruction on the application of the assessment. Assessment may be in conjunction with the assessment of other units of competency. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

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Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site informationmay include but not be limited to	• local conditions such as access and egress • work method statements.
Hazards may include but not limited to:	• ground stability (eg. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes, trees, buildings, etc) • insufficient lighting • traffic (e.g. pedestrians, vehicles, plant) • weather (e.g. wind, lightning, storms) • other specific hazards (e.g. trip hazards, heights, radio interference, etc).
Hazard prevention/control measures	The systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of controls, including: 1. elimination. 2. substitution. 3. isolation. 4. engineered control measures. 5. safe work practices. 6. personal protective equipment.
Appropriate standard s may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards.

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RANGE STATEMENT

Lifting Equipment may include but not limited to:	• fibre ropes • wire ropes • chain • wire and synthetic slings • shackles • eyebolts • beam clamps • plate clamps • spreader beams • lifting beams • pallet forks and cages • concrete kibbles • personnel boxes.
Communication Methods may include but are not limited to:	• written instructions • signage, • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol.
Cranes may include but not limited to:	• tower cranes (including self erecting) • portal boom cranes • vehicle loading cranes • slewing mobile cranes • non-slewing cranes • derrick cranes.
Appropriate personnel may include but are not limited to:	• supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations.
Communication Equipment may include but not limited to:	• fixed channel two-way radios • whistles • bells.
Personal protective equipment (PPE) may include but not limited to:	• hard hat • safety boots • gloves • high visibility clothing • reflective vest • relevant breathing, hearing, sight, skin and sun protection.
Load destination may include but	• ground

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RANGE STATEMENT

not limited to:	• loading platforms • suspended floors • vehicles.
Communication signals may include but not limited to:	• stop - hand • stop - whistle • hoist up - hand • hoist up - whistle • hoist down - hand • hoist down - whistle • luff boom down - hand • luff boom down - whistle • luff boom up - hand • luff boom up - whistle • telescope out - hand • telescope out - whistle • telescope in - hand • telescope in - whistle • slew left - hand • slew left - whistle • slew right - hand • slew right - whistle.
Defective Equipment may include but not limited to:	• excessive wear • damage • stretched • broken wires • cut/damaged fibres.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

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Co-requisite units Nil

Functional area

Functional area

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CPCCLRG3001A Licence to perform rigging basic level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit specifies the outcomes required to perform basic rigging work associated with movement of plant and equipment, steel erections, hoists (including mast climbing hoists), placement of pre-cast concrete, safety nets and static lines, perimeter safety screens and shutters; and cantilever crane loading platforms for licensing purposes.

Application of the Unit

Application of the unit

This unit requires the applicant to be able plan the work, select and inspect equipment, set up task, erect structures and plant and dismantle structures and plant.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

This unit has a pre-requisite requirement. This requirement may be met by either the successful completion of the unit *CPCCLDG3001A Licence to perform dogging* or holding a valid licence for dogging.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units

CPCCLDG3001A	Licence to perform dogging

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed. 1.2. Potential workplace ***hazards*** are identified. 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment. 1.4. Site information is obtained. 1.5. All ***forces and loads*** associated with erecting and dismantling ***structures*** and ***associated plant*** are considered in consultation with ***appropriate personnel***. 1.6. ***Rigging equipment*** and ***associated equipment*** are identified in consultation with appropriate personnel according to ***procedures*** and site information.

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ELEMENT	PERFORMANCE CRITERIA
	1.7. *Safety equipment* is identified.
	1.8. Appropriate ***communication methods*** are identified with appropriate personnel.
2. Select and inspect equipment.	2.1. Rigging equipment and associated equipment are selected and inspected according to procedures and the appropriate standard.
	2.2. Safety equipment is selected and inspected according to procedures.
	2.3. All defective rigging equipment, associated equipment and safety equipment is isolated, reported and recorded according to procedures.
	2.4. ***Communication equipment*** is selected and inspected for serviceability (where applicable.
3. Set up task.	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures.
	3.2. ***Ground suitability*** is inspected and checked (where appropriate).
	3.3. Site information is reviewed, interpreted and communicated to appropriate personnel and ***appropriate personnel***.
	3.4. All forces and loads associated with erecting and dismantling structures and associated plant are determined in consultation with appropriate personnel.
	3.5. Safety equipment is fitted and worn correctly (where appropriate).
	3.6. Rigging equipment and associated plant are positioned for work application and stability according to procedures.
	3.7. Methods of applying ***temporary connections*** using fibre rope are applied according to procedures and the appropriate standard.
4. Erect structures and plant.	4.1. Structures and associated plant are erected according to procedures and site information.
	4.2. Stability of structures and associated plant is maintained during erection according to procedures.
	4.3. Work is conducted safely at heights including safe and effective use of safety equipment.
	4.4. Appropriate communication methods and communication equipment, are used to co-ordinate the tasks.
	4.5. Associated plant and rigging equipment is used

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ELEMENT	PERFORMANCE CRITERIA
	according to procedures and the appropriate standard. 4.6. Temporary guys, ties, propping and shoring, including ***flexible steel wire rope***, and tubing, are connected where required. 4.7. Associated equipment is used in a safe and appropriate manner. 4.8. The completed task is inspected according to the appropriate standard. 4.9. Excess materials are removed from the work area (where applicable).
5. Dismantle structures and plant.	5.1. Structures and associated plant are dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Stability of structures and associated plant is maintained during dismantling according to procedures. 5.4. Rigging equipment, associated equipment, safety equipment and associated plant are inspected for damage and defects. 5.5. All defective rigging equipment, associated equipment, associated plant and safety equipment are isolated reported and recorded according to procedures. 5.6. Rigging equipment and associated equipment are stored. according to procedures and the appropriate standard. 5.7. Hazard prevention/control measures are removed (where appropriate).

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Required skills for this unit are:

- ability to calculate Safe Working Load (SWL) and Working Load Limit (WLL)
- ability to erect and dismantle, level, plumb and stabilise associated plant and structures
- ability to work safely at heights including the correct application of safety equipment.
- accurate interpretation of basic structural charts and structural plans (site information)
- applying methods for making temporary connections of ropes using fibre and synthetic types
- apply methods of splicing and whipping fibre and synthetic ropes
- correct application and use of all rigging and associated equipment
- risk assessment and hazard control strategies
- interpersonal and communication skills at a level sufficient to site/workplace requirements. This includes the relevant communication methods and equipment.
- verify problems and equipment faults and demonstrate appropriate response.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- ability to interpret manufacturer's specifications for all plant and equipment use in rigging operations
- knowledge of principles relating to all plant, equipment and structural stability
- knowledge of the types and functions of rigging, safety and associated equipment including an understanding of their limitations.
- organisational and workplace standards, requirements, policies and procedures for rigging
- understanding of the hierarchy of hazard identification and control
- relevant Commonwealth, state or territory and local government OHS legislation, standards and codes of practice for undertaking rigging activities
- understanding of inspection and maintenance requirements of a wide range of appropriate plant and equipment in line with Australian Standards or manufacturer's specifications
- estimation of ground bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work.

State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment endorsed by the national body responsible for OHS matters for the assessment of this unit.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- comply with OHS licensing legislation.
- effectively communicate and work safely with others in the work area.
- effectively conduct risk assessment and management procedures.
- effectively complete the following tasks:-
  - inspection of all plant and equipment, and
  - installation of a fall arrest system (Static line), and
  - use of a safety harness / fall arrest system, and
  - installation of crane loading platforms and
  - installation of a safety net, and
  - installation of a shutter and safety screen, and
  - demonstrated ability to work safely at heights, and
  - erection of structural steel, and
  - erection of precast panel, and
  - set up and operation of a winch for load movement, and
  - installation of a materials hoist, or
  - installation of a mast climber.
- effectively demonstrate the following knots,

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	bends and hitches:- • Sheet bend, • Becket hitch, • Running bowline, • Double bowline. • effectively demonstrate the following splices and whippings:- • Eye splice, • Back splice, • Short splice, • Sail makers whipping, • Common whipping, • West countryman's
Context of and specific resources for assessment	Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the National OHS endorsed Assessment Instrument. Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting. Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace. Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints. Assessment is to comply with the requirements of any relevant Standards or operating procedures for basic rigging. Applicants must have access to: • personal protective equipment (PPE) for the purpose of the Performance Assessment. • appropriate safety equipment in safe condition • appropriate rigging equipment, associated equipment associated plant in safe condition as described in the endorsed assessment instrument • communication equipment (e.g. two-way

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	radios) where applicable • appropriate materials as required for safe erection of structures • appropriate materials for conducting fibre rope slicing, whipping, knots, bends and hitches.
Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instruments. These Instruments provide advice on their application. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment may be in conjunction with the assessment of other units of competency. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include but are not limited to:	• ground stability (e.g. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes) (**NB**: minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or

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RANGE STATEMENT

	electrical supply authority.) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other specific hazards (e.g. dangerous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.
Appropriate standards may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site Information may include, but not limited to:	• local conditions such as access and egress, • work method statements, • site specific job safety analyses and other site specific documentation as required. • task plans / Schedules and structural plans.
Forces and Loads may include, but not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Structures may include but are not limited to:	• structural steel • precast panels.
Associated plant may include but not limited to:	• static lines • safety nets • hoists

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RANGE STATEMENT

	• mast climbers • loading platforms.
Appropriate personnel may include:	• engineers • supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations.

Rigging Equipment may include but is not limited to:	• scaffolds
	• elevated work platforms
	• personnel box
	• cantilevered crane loading platforms
	• mast climbers.
	• safety screens and shutters
	• cranes including but not limited to:
	  • non-slewing cranes
	  • mobile slewing cranes
	  • vehicle loading cranes
	  • tower cranes
	  • self-erecting tower cranes
	  • portal boom cranes
	  • derrick cranes
	  • bridge and gantry cranes.

Associated equipment may include but is not limited to:	• all types of power and manually operated lifting gear • fibre ropes • flexible steel wire rope (FSWR) • chains • wire and synthetic slings • shackles • terminations • wedge sockets • eye bolts • beam clamps • plate clamps • rope grips • turnbuckles • rigging screws • chain blocks • lever blocks • lever-action winches

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RANGE STATEMENT

	• sheaves • spreader bars • lifting beams • jacks • levers • skates • wedges • rollers • girder trolley
Procedures may include but is not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes of practice • workplace procedures (work instructions, operating procedures, checklists).
Safety Equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel • static safety lines • safety nets.
Communication Methods may include but is not limited to:	• verbal and non-verbal language • written instructions • signage • hand signals • listening, • questioning to confirm understanding, and appropriate worksite protocol. **NB**: Mobile phones are not to be used for signalling purposes during the rigging process.
Communication equipment may include but is not limited to:	• fixed channel two-way radios
Hazard prevention/control measures may include but is not limited to:	• safety tags on electrical switches/isolators • powerlines are insulated • safety observer used inside exclusion zone • power disconnected • traffic barricades and control • pedestrian barricades • trench covers

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RANGE STATEMENT

	• movement of obstructions • personal protective equipment • adequate illumination • safety shutters and screens.
Ground suitability may include but is not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete • suspended concrete floors • building roofs • landings • ground bearing pressure.
Appropriate personnel may include but not limited to	• other riggers • doggers • crane operators.
Temporary connections may include but not limited to:	• knots • bends • hitches • spicing • whipping.
Flexible Steel Wire Rope (***FSWR***) includes:	• identification, uses and connections. May include termination for: • static lines, • guys, • purchase systems, • lashing, • cranes, • hoist and winch ropes.

Unit Sector(s)

Unit sector Construction

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Co-requisite units

Co-requisite units Nil

Functional area

Functional area

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CPCCLSF2001A Licence to erect, alter and dismantle scaffolding basic level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit specifies the outcomes required to erect, alter and dismantle scaffolding at the basic level, consisting of scaffolding work connected with the operation or use of modular or pre-fabricated scaffolds, cantilevered materials hoists with a maximum working load of 500kg, ropes and gin wheels, safety nets and static lines, and bracket scaffolds (tank and formwork) for licensing purposes.

Application of the Unit

Application of the unit This unit covers the scope of work to plan the job, select and inspect equipment, set up task, erect scaffold and scaffold equipment and dismantle scaffold and scaffold equipment.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form it state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units Nil

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Prerequisite units Nil

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed. 1.2. Potential workplace ***hazards*** are identified. 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment. 1.4. Site information is obtained. 1.5. ***Scaffold***, ***associated equipment*** and ***scaffolding equipment*** are identified from site information and in consultation with ***appropriate personnel*** (where applicable). 1.6. ***Safety equipment*** is identified. 1.7. All ***forces and loads*** exerted on and by the scaffold and/or scaffolding equipment are determined and calculated. 1.8. Appropriate ***communication methods*** are identified

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ELEMENT	PERFORMANCE CRITERIA
	with appropriate personnel.
2. Select and inspect plant and equipment.	2.1. Scaffold, associated equipment and scaffold equipment are selected and inspected according to ***procedures*** and site information. 2.2. Safety equipment is selected and inspected according to procedures. 2.3. All defective Scaffold, associated equipment, scaffold equipment and safety equipment are isolated according to procedures. 2.4. All defective Scaffold, associated equipment, scaffold equipment and safety equipment are reported and recorded according to procedures. 2.5. ***Communication equipment*** is selected and inspected for serviceability (where applicable).
3. Set up task	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures. 3.2. Ground suitability is checked. 3.3. Appropriate footings are prepared to support scaffold and scaffold equipment according to procedures and the appropriate standard. 3.4. Scaffold and scaffold equipment are prepared for erection according to procedures and the appropriate standard. 3.5. Safety equipment is fitted and secured according to procedures (where applicable). 3.6. Scaffold and scaffold equipment are positioned for work application and ***stability*** according to procedures and the appropriate standard.
4. Erect scaffold and scaffold equipment.	4.1. Scaffold and scaffold equipment are erected according to procedures and the appropriate standard. 4.2. Work is conducted safely at heights including safe and effective use of safety equipment. 4.3. Scaffold and scaffold equipment are erected consistent with site information. 4.4. Appropriate communication methods are used to coordinate the tasks. 4.5. Completed tasks are inspected for compliance with the appropriate standard. 4.6. Handover certificate is completed as required and handed to appropriate personnel. 4.7. Excess materials from the work area are removed

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ELEMENT	PERFORMANCE CRITERIA
	(where applicable).
5. Dismantle scaffold and scaffold equipment.	5.1. Scaffold and scaffold equipment are dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Scaffold, associated equipment and scaffold equipment are inspected for damage and defects. 5.4. All damaged and defective scaffold, associated equipment and scaffold equipment are tagged and isolated according to procedures. 5.5. Hazard prevention/control measures are removed (where appropriate). 5.6. All damaged and defective scaffold, associated equipment and scaffold equipment are reported and recorded according to procedures and appropriate action taken.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- ability to calculate Safe Working Load (SWL) and Working Load Limit (WLL)
- ability to erect scaffold within the scope of the basic scaffolder
- ability to erect, level, plumb and stabilise cantilever hoists and scaffolds
- ability to interpret manufacturer's specifications for plant and equipment
- ability to work safely at heights
- ability to set up fall arrest systems, including safety nets
- ability to work safely in confined spaces
- accurate interpretation of basic structural charts and structural plans
- applying methods for making temporary connection using fibre ropes
- correct application of all scaffolding equipment
- methods for making temporary connection of guy ropes and static lines using Flexible Steel Wire Rope (FSWR)
- verify problems and equipment faults and demonstrate appropriate response.

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REQUIRED SKILLS AND KNOWLEDGE

Required knowledge

Required knowledge for this unit is:

- use of appropriate mathematical procedures for estimation and measurement of loads Commonwealth, state or territory OHS legislation and local government regulations, including standards and codes of practice relevant to the full range of techniques for undertaking basic scaffolding activities
- knowledge of principles relating to plant and equipment stability
- knowledge of types of scaffolding and their application
- knowledge of scaffolding erection and dismantling techniques
- knowledge of types of hoists, plant and equipment associated with basic scaffolding and their use/s
- risk assessment and control, including understanding of the hierarchy of control
- estimation of bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment
- load capabilities of different types of scaffolding constructions
- understanding and application of organisational and workplace standards, requirements, policies and procedures for scaffolding
- safety equipment applicable to scaffolding
- understanding and application of the inspection and maintenance requirements for basic scaffold, associated equipment and scaffold equipment
- uses and limitations of tools and equipment, appropriate to scaffolding tasks and activities.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work. State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment endorsed by the national body responsible for OHS matters for the assessment of

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EVIDENCE GUIDE

	this unit.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to:
	• comply with OHS licensing requirements.
	• effectively communicate and work safely with others in the work area.
	• effectively apply risk assessment and hazard management procedures at a basic scaffolder level.
	• effectively complete the planning, erection and dismantling of a scaffolding system, in accordance with procedures, including a minimum of erect and dismantle:
	  • Modular Scaffold with return and ladder access and platform brackets (hop-up brackets)
	  • Bracket Scaffold
	  • Mobile Scaffold
	  • gin wheel
	  • Cantilever Hoist
	  • safety net and static line
	  • safety screen
	Scaffold to be of a minimum height of at least 5.0 metres above the supporting surface with full edge protection (includes safety screen) for each work platform including toe boards and handrails.
	• correctly demonstrate fibre rope bends and hitches.
	• effectively conduct pre and post operational checks of basic scaffolding.
	• complete handover certificate as required.

Context of and specific resources for assessment	• Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the National OHS endorsed Assessment Instrument • Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting • .Assessors must ensure that the assessment in

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	the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace
	• Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints for basic scaffolding
	• Applicants must have access to:
	  • personal protective equipment (PPE) for the purpose of the Performance Assessment
	  • appropriate safety equipment in safe condition
	  • appropriate scaffolding and associated scaffolding equipment
	  • communication equipment (e.g. fixed channel two way radios) where applicable
	  • appropriate personnel to assist with the erecting and dismantling of scaffold and scaffold equipment.

Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instruments. These Instruments provide advice on their application. Assessment may be in conjunction with the assessment of other units of competency. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

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Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include but not limited to:	• ground conditions (e.g. ground bearing pressure/s, back filled trenches, underground services, slopes) • overhead hazards (e.g. power lines, service pipes) (minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or electrical supply authority) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other site specific hazards (e.g. hazardous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.
Appropriate standards may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site Information may include, but not be limited to:	• local conditions such as access and egress • work method statements

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RANGE STATEMENT

	• site-specific job safety analyses and other documentation as required • task plans.

Scaffold may include but not limited to:	• mobile scaffolding
	• bracket scaffolding
	• modular scaffolding, including:
	  • steel
	  • fibreglass and
	  • aluminium frame scaffolding
	• prefabricated scaffolding.

Associated equipment may include but not limited to:	• planks
	• flexible steel wire rope and fittings.
	NB: including identification, uses and connections which may include termination for static lines and guys for cantilever hoists.
	• ladders
	• tie tubes and fittings
	• fibre rope
	NB: including identification and uses (natural and synthetic), and connections associated with bends and hitches.
	• stairways and screening
	• hand tools, including, but not limited to:
	  • box spanners
	  • hammers
	  • spirit levels
	  • tape measures
	  • scaffold belts
	  • podgers
	  • hammers
	  • wire nips
	  • wrenches
	  • torpedo levels
	  • shovels
	  • spanners
	  • cutters
	  • hammer drills
	  • sledge hammers

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RANGE STATEMENT

	• wheel barrows and • relevant maintenance equipment.
Scaffolding equipment may include but not limited to:	• materials hoists • gin wheels • safety nets • static lines and fittings.
Appropriate personnel may include, but are not limited to:	• supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations • other scaffolders • other site personnel as applicable.
Safety equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel.
Forces and Loads may include, but are not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Communication Methods may include but not limited to:	• verbal and non-verbal language • written instructions • signage • communication signals • listening • questioning to confirm understanding, and appropriate worksite protocol.
Procedures may include but not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes of practice • workplace procedures (work instructions, operating procedures, checklists) • reporting and recording procedures such as e.g. equipment defect/s.
Communication equipment may include but is not limited to:	• fixed frequency two way radios • mobile phones.
Hazard prevention/control measures may include but not	• safety tags on electrical switches/isolators • safety observer used inside exclusion zone

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RANGE STATEMENT

limited to:	(e.g. Spotter), to include the use of power line warning systems (e.g. Tiger tails) • power disconnected by competent authority where applicable • traffic and pedestrian barricades and controls • safe and adequate access / egress is established • personal protective equipment • adequate illumination.
Ground suitability may include but not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete.
Stability may include but is not limited to:	• ground bearing pressure • sole plates/boards • screw jacks • levelling • ties/guys.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

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Functional area

Functional area

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CPCCLSF3001A Licence to erect, alter and dismantle scaffolding intermediate level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit specifies the outcomes required to erect, alter and dismantle scaffolding at the Intermediate level which includes use and operation of Cantilevered crane-loading platforms, Cantilevered and spurred scaffolds, Barrow ramps and sloping platforms, perimeter safety screens and shutters Mast climbers, and tube and coupler scaffolds (including tube and coupler covered ways and gantries) for licensing purposes.

Application of the Unit

Application of the unit

This unit covers the scope of work to plan the job, select and inspect equipment, set up task, erect scaffold and scaffold equipment and dismantle scaffold and scaffolding equipment.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

This unit has a pre-requisite requirement. This requirement may be met by either the successful completion of the unit *CPCCLSF2001A Licence to erect, alter and dismantle scaffolding basic level* or holding a valid licence for basic scaffolding.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units

	CPCCLSF2001A	Licence to erect, alter and dismantle scaffolding basic level

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed. 1.2. Potential workplace ***hazards*** are identified. 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment. 1.4. Site information is obtained.

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ELEMENT	PERFORMANCE CRITERIA
	1.5. ***Scaffold***, ***associated equipment*** and ***scaffold equipment*** are identified from site information and in consultation with appropriate ***personnel*** (where applicable). 1.6. ***Safety equipment*** is identified. 1.7. All ***forces and loads*** exerted on and by the scaffold and/or scaffolding equipment are determined and calculated. 1.8. Appropriate ***communication methods*** are identified with appropriate personnel.
2. Select and inspect equipment.	2.1. Scaffold, associated equipment and scaffold equipment are selected and inspected according to ***procedures*** and site information. 2.2. Safety equipment is selected and inspected according to procedures. 2.3. All defective scaffold, associated equipment, scaffold equipment and safety equipment are isolated according to procedures. 2.4. All defective scaffold, associated equipment, scaffold equipment and safety equipment are reported and recorded according to procedures. 2.5. ***Communication equipment*** is selected and inspected for serviceability (where applicable).
3. Set up task.	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures. 3.2. Ground suitability is checked. 3.3. Appropriate footings are prepared to support scaffold and scaffold equipment according to procedures and the appropriate standard. 3.4. Scaffold and scaffold equipment are prepared for erection 3.5. Fit safety equipment and secure according to procedures (where applicable). 3.6. Scaffold and scaffold equipment are positioned for work application and ***stability*** according to procedures and the appropriate standard.
4. Erect scaffold and scaffolding equipment.	4.1. Scaffold and scaffold equipment are erected according to procedures and the appropriate standard. 4.2. Work is conducted safely at heights including safe and effective use of safety equipment. 4.3. Scaffold and scaffold equipment are erected

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ELEMENT	PERFORMANCE CRITERIA
	consistent with site information. 4.4. Appropriate communication methods are used to coordinate the tasks. 4.5. Completed tasks are inspected for compliance with the appropriate standard. 4.6. Handover certificate is completed as required and handed to appropriate personnel. 4.7. Excess materials from the work area are removed (where applicable).
5. Dismantle scaffold and scaffolding equipment.	5.1. Scaffold and scaffold equipment are dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Scaffold, associated equipment and scaffold equipment are inspected for damage and defects. 5.4. All damaged and defective scaffold, associated equipment and scaffold equipment are tagged and isolated according to procedures. 5.5. Hazard prevention/control measures are removed (where appropriate). 5.6. All damaged and defective scaffold, associated equipment and scaffold equipment are reported and recorded according to procedures and appropriate action taken.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- ability to erect scaffold and scaffolding equipment within the scope of the intermediate scaffolder
- ability to erect, level, plumb and stabilise scaffolds and scaffold equipment within the scope of the intermediate scaffolder
- ability to interpret manufacturer's specifications for plant and equipment

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REQUIRED SKILLS AND KNOWLEDGE

- ability to work safely at heights
- accurate interpretation of basic structural charts and structural plans
- correct application of all scaffolding equipment
- verify problems and equipment faults and demonstrate appropriate response.

Required knowledge

Required knowledge for this unit is:

- use of appropriate mathematical procedures for estimation and measurement of loads
- Commonwealth, state or territory OHS legislation and local government regulations, including standards and codes of practice relevant to the full range of techniques for undertaking intermediate scaffolding activities
- knowledge of principles relating to plant and equipment stability
- knowledge of types of scaffolding and their application
- knowledge of scaffold and scaffold equipment erection and dismantling techniques
- knowledge of types of scaffold and scaffold equipment, associated with intermediate scaffolding and their use/s
- risk assessment and control, including understanding of the hierarchy of control
- load capabilities of different types of scaffolding constructions
- understanding and application of organisational and workplace standards, requirements, policies and procedures for scaffolding
- application of safety equipment applicable to scaffolding
- understanding and application of the inspection and maintenance requirements for intermediate scaffold, associated equipment and scaffold equipment
- uses and limitations of tools and equipment, appropriate to scaffolding tasks and activities.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work. State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for

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EVIDENCE GUIDE

	Assessment endorsed by the national body responsible for OHS matters for the assessment of this unit.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to:
	• Effectively communicate and work safely with others in the work area.
	• Effectively apply risk assessment and hazard management procedures at an intermediate scaffolder level.
	• Effectively complete the planning, erection and dismantling of scaffolding systems, in accordance with procedures, including a minimum of erect and dismantle the following:
	  • Cantilevered and spurred scaffolds
	  • Barrow ramps and/ or sloping platforms
	  • Tube and coupler scaffolds
	  • Cantilevered crane-loading platforms
	  • Mast climbers
	Cantilevered, spurred and tube and coupler scaffolds to be of a minimum height of 5.0 metres above the supporting surface with full edge protection, for each work platform including toe boards and handrails.
	• Apply safety screen to tube and coupler scaffold.
	• Effectively conduct compliance inspections of scaffold and scaffold equipment for intermediate scaffolding.
	• Complete handover certificate as required.

Context of and specific resources for assessment	• Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the National OHS endorsed Assessment Instrument. • Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting. • Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a

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EVIDENCE GUIDE

	suitable working area is made available to suit the assessment and the workplace.
	• Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints for intermediate scaffolding.
	• Applicants must have access to:
	  • personal protective equipment (PPE) for the purpose of the Performance Assessment
	  • appropriate safety equipment in safe condition
	  • appropriate scaffold and scaffold equipment in safe condition
	  • site information as described in the mandated assessment instrument
	  • communication equipment (e.g. fixed channel two way radios) where applicable
	  • appropriate personnel to assist with the erecting and dismantling of scaffold and scaffold equipment.

Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instruments. These Instruments provide advice on their application. Assessment may be in conjunction with the assessment of other units of competency. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed assessment instruments may be obtained from state/territory OHS regulators.

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Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include but not limited to:	• ground conditions (e.g. ground bearing pressure/s, back filled trenches, underground services, slopes) • overhead hazards (e.g. power lines, service pipes) (minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or electrical supply authority.) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other site specific hazards (e.g. hazardous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.
Appropriate standards may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site Information may include, but not limited to:	• local conditions such as access and egress • work method statements

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RANGE STATEMENT

	• site-specific job safety analyses and other documentation as required • task plans.
Scaffold may include but not limited to:	• all scaffolds at the basis level • cantilevered and spurred scaffolds • barrow ramps and sloping platforms • tube and coupler scaffolds (including tube and coupler covered ways and gantries) • cantilever loading platforms.
Associated equipment may include but not limited to:	• all associated equipment from basic scaffolding level • independent adjustable props.
Scaffold equipment may include but not limited to:	• all scaffold equipment at the basic level • mast climbers • screen and shutters.
Appropriate personnel may include, but are not limited to:	• supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations • other scaffolders • other site personnel as applicable.
Safety equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel.
Forces and Loads may include, but are not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Communication Methods may include but not limited to:	• verbal and non-verbal language • written instructions • signage • communication signals • listening • questioning to confirm understanding, and appropriate worksite protocol.
Procedures may include but not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes

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RANGE STATEMENT

	of practice • workplace procedures (work instructions, operating procedures, checklists) • reporting and recording procedures such as e.g. scaffold and scaffold equipment defects.
Communication equipment may include but not limited to:	• fixed frequency two way radios • mobile phones.
Hazard prevention/control measures may include but not limited to:	• safety tags on electrical switches/isolators • safety observer used inside exclusion zone (e.g. Spotter), to include the use of power line warning systems (e.g. Tiger tails) • power disconnected by competent authority where applicable. • traffic and pedestrian barricades and controls • safe and adequate access / egress is established • personal protective equipment • adequate illumination.
Ground suitability may include but not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete.
Stability may include but not limited to:	• ground bearing pressure • sole plates/boards • screw jacks • levelling • ties/guys.

Unit Sector(s)

Unit sector Construction

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Co-requisite units

Co-requisite units Nil

Functional area

Functional area

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CPPFES2027A Inspect, test and maintain non-gaseous pre-engineered fire-suppression systems

Modification History

Revised unit

Element structure and performance criteria changed to incorporate outcomes of deleted units:

- PRMPFES29B Inspect, test and maintain pre-engineered powder fire suppression systems
- PRMPFES30B Inspect, test and maintain pre-engineered wet chemical fire suppression systems
- PRMPFES31B Inspect, test and maintain pre-engineered water mist fire suppression systems

Skills and knowledge requirements and the range statement are more comprehensive

Unit based on PRMPFES27B Inspect, test and maintain pre-engineered aqueous fire suppression systems

Unit Descriptor

This unit of competency specifies the outcomes required to inspect, test and maintain non-gaseous pre-engineered fire-suppression systems.

Application of the Unit

This unit of competency supports fire protection technicians responsible for regularly inspecting, testing and maintaining pre-engineered, foam, wet chemical, powder or water mist fire-suppression systems.

This unit does not apply to any installation, replacement, maintenance and repair functions that are restricted to licensed trades or occupations (subject to relevant state and territory regulations).

Licensing/Regulatory Information

Work in this area must be completed according to relevant legislative, industry, customer and organisational requirements, including occupational health and safety (OHS) policies and procedures.

Different states and territories may have regulatory mechanisms that apply to this unit. Candidates are advised to check for regulatory limitations.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	**Prepare for inspection, testing and maintenance.**	1.1	***Legislative and industry requirements*** are interpreted, ***confirmed*** and applied to ***organisational requirements***.
		1.2	***Non-gaseous pre-engineered fire-suppression systems*** are ***checked for compliance*** with legislative and industry requirements, and ***action*** is taken according to organisational requirements.
		1.3	Preparations for inspection, testing and maintenance work are made according to organisational requirements.
		1.4	***Safety procedures*** are followed according to organisational, manufacturer and ***customer requirements***.
		1.5	Work permits are obtained prior to entering customer premises.
		1.6	***Relevant persons*** are consulted before commencing procedures.
2	**Inspect and survey installed non-gaseous**	2.1	Type of **non-gaseous** pre-engineered fire-suppression system and ***extinguishing agent*** is identified according to operation and application.

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	pre-engineered fire-suppression systems.	2.2	***System components*** are identified, located and inspected according to function and manufacturers' manuals.
		2.3	***Auxiliary shutdown devices*** of fire-suppression system or equipment interfaces and alarm devices forming part of the fire-suppression system are identified and inspected.
		2.4	Changes to non-gaseous pre-engineered fire-suppression system, the protected space or its use are identified according to relevant state and territory regulations, manufacturers' documentation and Australian standards.
3	**Test an installed non-gaseous pre-engineered fire-suppression system.**	3.1	***Testing procedures*** are completed and recorded according to relevant ***maintenance schedule***, Australian standards and manufacturers' documentation.
		3.2	***Documentation*** for recording test and inspection results is completed according to organisational, customer and manufacturers' requirements.
4	**Maintain and repair an installed non-gaseous pre-engineered fire-suppression system.**	4.1	System is maintained according to requirements of relevant maintenance schedule, customer requirements, Australian standard and manufacturers' documentation.
		4.2	Faulty equipment or extinguishant is reported, and rectified or replaced according to ***work procedures***, customer requirements and manufacturers' technical specifications.
		4.3	System is reinstated as fully operational as specified in manufacturers' documentation and system design standards.
		4.4	Documentation for recording maintenance and repairs is completed and distributed according to organisational, customer and manufacturers' requirements.

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- customer service skills
- language, literacy and numeracy skills to:
  - communicate with others clearly and concisely, verbally and in writing
  - read and comply with work instructions and specifications
  - read and record measurements
  - record and report information neatly and legibly
- planning and organising skills to:
  - estimate time to complete activities
  - prioritise tasks
- interpersonal skills to relate to people from a range of social and cultural backgrounds
- skills to work safely when:
  - applying workplace housekeeping procedures
  - handling and transporting containers according to legislation, manufacturers' procedures and work practices
  - using hand and power tools
- technical skills to:
  - operate standard controls on proprietary systems to verify system operation to manufacturers' requirements
  - pressurise containers in situ, using pressure regulators connected to gaseous containers, such as a nitrogen cylinder
  - replace extinguishing agents and components in a manner that conforms to OHS requirements, environmental requirements and manufacturers' specifications
  - test system components according to manufacturers' requirements

Required knowledge

- action to take when a breach of health, safety or other policy occurs
- identification and purpose of the major components in **non-gaseous** pre-engineered fire-suppression systems for different manufacturers' proprietary systems
- key features of legislation and regulations relevant to **non-gaseous** pre-engineered fire-suppression systems, including:
  - implications of:
    - not applying legislative requirements to job functions
    - not following safety procedures
    - incorrect inspection, testing and maintenance functions
  - limitations of maintenance and repair functions that may be conducted by the fire protection technician
- manufacturers' requirements and standards applicable to inspecting, testing and maintaining non-gaseous pre-engineered fire-suppression systems
- procedures for inspecting, testing and maintaining system to verify operation in line with manufacturers' requirements

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- purpose of fire-suppression system shutdown and isolation during maintenance
- purpose of **non-gaseous** pre-engineered fire-suppression systems
- types of extinguishing agents, their characteristics and use

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	This unit of competency could be assessed by observation of practical demonstration of inspecting, testing and maintaining **non-gaseous** pre-engineered fire-suppression systems.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the required skills and knowledge specified in this unit for at least one type of **non-gaseous** pre-engineered fire-suppression system in two different installation locations.
	In particular the person should demonstrate the ability to:
	• locate, interpret and apply relevant information, standards and specifications
	• comply with organisational policies and procedures, including quality requirements
	• conduct inspection, testing, and preventive maintenance according to the relevant Australian standard and manufacturers' documents on at least two installed systems
	• replace or repair system components, such as:
	  • detector
	  • fire alarm panel
	• replace (recharge) extinguishing agent and pressurise or reinstate systems to fully operational condition according to manufacturers' documentation, working on systems with at least two different extinguishing agents
	• replace or repair system components, such as:
	  • actuator
	  • nozzle
	  • pipe fitting
	  • system container.

Context of and specific resources for assessment	Assessment of essential underpinning knowledge may be conducted in an off-site context. It is to comply with relevant regulatory or Australian standards' requirements.

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	Resource implications for assessment include: • access to customer premises or a simulated workplace environment • assessment documentation • necessary tools, specialist equipment, manuals and relevant documentation • training and assessment record book.
Method of assessment	Assessment methods must: • satisfy the endorsed Assessment Guidelines of the Property Services Training Package • include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application • reinforce the integration of employability skills with workplace tasks and job roles • confirm that competency is verified and able to be transferred to other circumstances and environments.
Guidance information for assessment	Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support. Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed. This unit could be assessed on its own or in combination with other units relevant to the job function.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Legislative and industry requirements may include:	• dangerous goods regulations • environmental regulations • fire risk management section of AS 5062 Fire protection for mobile and transportable equipment

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	• licensing arrangements
	• manufacturers' system manuals
	• OHS legislation, regulations and codes
	• relevant commonwealth and state or territory building Acts, regulations and codes, such as Building Code of Australia (BCA)
	• relevant Australian standards, such as:
	  • AS 5062 Fire protection for mobile and transportable equipment
	  • AS 3772-2008 Pre-engineered fire protection systems for cooking equipment
	  • AS 1851 Maintenance of fire protection systems and equipment
	  • note: Australian standards are frequently revised and users must always check for currency and amendments
	• other relevant legislation relating to fire protection equipment, including:
	• international shipping codes
	• marine codes for different Australian States
	• system approval listing, such as:
	  • CSIRO ActivFire
	  • Factory Mutual (FM)
	  • Underwriters Laboratories (UL).

Requirements may be ***confirmed*** with:	• colleagues • managers • supervisors • team leaders.
Organisational requirements may include:	• job scheduling systems and communication devices • personnel practices and guidelines outlining work roles, responsibilities and delegations • recording and reporting documentation and systems • relevant OHS policies, procedures and programs • relevant rules and regulations • standard operating procedures, work instructions and manuals.

Non-gaseous pre-engineered fire-suppression systems are:	• fire protection systems consisting of:
	  • pipework with nozzle arrangement installed up to a maximum permitted design according to manufacturers' pre-engineered limitation requirements and applicable Australian standard (note: no hydraulic calculations are required to size pipework or nozzles)
	  • supply of extinguishing agent of predetermined quantity
	• fitted to:

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	• commercial cooking equipment, including:
	  • exhaust plenums
	  • exhaust systems
	  • associated ducts and filters
	• fixed plant used in a range of industry sectors, such as mining, marine, and power generation, including:
	  • engine bays
	  • fuel pumping skids
	  • generators
	• industrial vehicles used in a range of industry sectors, such as mining, forestry and waste management, including:
	  • draglines
	  • earthmovers
	  • graders
	  • trucks
	  • loaders.

Checking system compliance may include:	• applying inspection, test and survey requirements to equipment or systems to determine that they are:
	  • capable of operating as originally installed
	  • still suitable for the fire hazard or risk being protected, as no change in occupancy or use of the area protected has occurred since the system was installed or last modified
	  • providing the coverage and protection needed to meet original design or performance requirements.

Action may include:	• advising customer • documenting non-compliance • making equipment safe • reporting, as required.

Safety procedures may include:	• awareness of electrical hazards
	• emergency procedures
	• first aid
	• following confined spaces procedures
	• recognising hazards and risks
	• using personal protective equipment (PPE), including:
	  • safety glasses or goggles
	  • safety boots or shoes
	  • hard hats
	  • ear muffs or plugs
	• working safely:
	  • around electrical wiring, cables and overhead powerlines
	  • around tools and equipment

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	• on ladders and raised platforms.
Customer requirements may include:	• confirming or varying service instructions • following sign-in and sign-out procedures for entry to or exit from premises • industry requirements • insurance requirements • providing non-routine or urgent services • providing routine services • providing written or verbal confirmation of services provided and/or future maintenance schedule • sighting work permits • system specification.
Relevant persons may include:	• colleagues • managers • supervisors • team leaders.
Extinguishing agents may be:	• foam • powder • water mist • wet chemical • combination of any of the above when compatible.

System components may include:	• actuators:
	  • mechanical
	  • pyrotechnic
	  • solenoid
	• agent discharge nozzles
	• agent distribution pipework and hose
	• container valves
	• control equipment
	• detection devices
	• extinguishing agent containers, such as tanks and cylinders
	• support brackets.

Auxiliary shutdown devices transmit signals and may include:	• air conditioning shutdown signal to an electrical contactor to stop air conditioning • cooking fuel line shutdown signal to a gas solenoid valve on main inlet pipe supply to cooking appliances • cooking power supply shutdown signal to an electrical contactor to isolate main electrical supply to cooking appliances • signal from fire system to shut off valve, relay or solenoid to isolate fuel and oil supplies or release pressure from hydraulic tanks • vehicle or plant engine shutdown signal to engine emergency

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	shutdown circuitry.
Testing procedures may include:	• discharge • leaks • pressure • recharging • visual inspections.
Maintenance schedules may include:	• Australian standards • customer schedules • system manufacturers.
Documentation may include:	• certificates of inspection • corrective action reports • customer recommendation forms • equipment recommendation forms • logbooks • maintenance record system • product documentation • service agreements • service reports • system manufacturer's documentation.
Work procedures may include:	• assignment instructions • equipment manufacturers' requirements • instructions from colleagues, supervisor or manager • PPE requirements • reporting and documentation requirements • specific customer requirements.

Unit Sector(s)

Fire protection equipment

Custom Content Section

Not applicable.

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CPPFES3042A Install and commission pre-engineered fire-suppression systems

Modification History

Revised unit

Element structure and performance criteria changed to incorporate outcomes of deleted unit PRMFES41A Install pre-engineered fixed plant fire suppression systems

Unit based on PRMPFES42A Install, inspect, test and maintain pre-engineered fire system for transportable equipment

Unit Descriptor

This unit of competency specifies the outcomes required for a fire system technician to install and commission a pre-engineered fire-suppression system.

Application of the Unit

This unit of competency supports fire protection technicians responsible for installing pre-engineered fire-suppression systems. The person would often be employed by the system's manufacturer or the manufacturer's agent as an endorsed installer.

Individuals operate within the scope of their defined roles and responsibilities and verify according to work procedures and Australian standards that pre-engineered fire-suppression system is installed and operates as intended.

The unit must be applied strictly according to relevant state or territory legislative and industry requirements.

Licensing/Regulatory Information

Work in this area must be completed according to relevant legislative, industry, customer and organisational requirements, including occupational health and safety (OHS) policies and procedures.

Different states and territories may have regulatory mechanisms that apply to this unit. Candidates are advised to check for regulatory limitations.

Note: Some manufacturers provide endorsement of suitably trained personnel, which permits fire system technicians to undertake installation and commissioning work on particular pre-engineered systems.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Interpret and comply with legal and industry requirements relating to fire system operations.	1.1	***Legislative and industry requirements*** are interpreted, confirmed and applied in addition to ***organisational requirements***.
		1.2	Installation requirements of ***pre-engineered fire-suppression systems*** are ***checked for compliance*** with legislative and industry requirements and ***action*** is taken according to organisational requirements.
		1.3	Preparations for installation work are made according to organisational requirements.
2	Conduct pre-installation inspections and checks.	2.1	Necessary work permits are obtained prior to entering customer premises.
		2.2	Risk assessment review of equipment is conducted and additional risk reduction measures are reviewed with customer according to legislative and industry requirements and type of ***extinguishing agent***.
		2.3	Installation design is confirmed as appropriate according to ***customer requirements*** and manufacturers' specifications.
		2.4	Scope of protection, operational parameters, and system and equipment interfaces are determined according to organisational and customer requirements, Australian standards and manufacturers' specifications.

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		2.5	Installation and location of equipment are planned to satisfy customer requirements and manufacturers' specifications.
		2.6	Materials are assembled ready for installation according to manufacturers' specifications.
3	Install a pre-engineered fire-suppression system.	3.1	***System components*** are installed according to customer and organisational requirements, Australian standards and manufacturers' instructions.
		3.2	***Auxiliary shutdown*** fire system and equipment interface and alarm device connections are installed according to customer requirements, Australian standards and manufacturers' specifications.
		3.3	System is charged according to customer and organisational requirements, Australian standards and manufacturers' specifications.
		3.4	Installation site is left clean and tidy on completion of work.
		3.5	Installation ***documentation*** is completed according to Australian standards and legislative and manufacturers' requirements.
4	Commission an installed fire-suppression system.	4.1	Safety procedures are followed according to customer, organisational and manufacturers' requirements.
		4.2	***Commissioning procedures and tests*** are conducted on componentry according to Australian standards and manufacturers' requirements.
		4.3	System is reinstated as fully operational status as specified in manufacturers' documentation and organisational requirements.
		4.4	Commissioning results are recorded according to relevant ***commissioning schedule***, Australian standards and manufacturers' documentation.
		4.5	Documentation on installed system and commissioning is completed according to organisational, customer and manufacturers' requirements.

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- skills to work safely when:
  - applying workplace housekeeping procedures
  - handling and transporting containers
  - using hand and power tools
- effective customer service skills
- language, literacy and numeracy skills to:
  - communicate with others clearly and concisely, verbally and in writing
  - interpret risk assessment documents to verify system requirements and identify fire hazards not considered in initial design risk assessment
  - read and comply with work instructions and specifications
  - read and record measurements
  - record and report information neatly and legibly
- planning and organising skills to:
  - estimate time to complete activities
  - prioritise tasks
- interpersonal skills to relate to people from a range of social and cultural backgrounds
- technical skills to:
  - install and test system components according to manufacturers' requirements
  - install brackets and high-pressure hose and metal tubing to meet manufacturers' requirements
  - locate nozzles, pipe runs, containers, actuators, fire detectors and other system components to meet manufacturers' requirements
  - operate standard controls on proprietary systems to verify system operation to manufacturers' requirements
  - pressurise containers in situ, using pressure regulators connected to gaseous containers, such as a nitrogen cylinder
  - replace extinguishing agent and components
  - terminate or join flexible high-pressure hose and metal tubing to meet manufacturers' requirements

Required knowledge

- features of legislation and regulations relevant to the application, for example fire protection of:
  - mobile and transportable equipment

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  - commercial cooking equipment
  - marine engine compartments
- importance of adhering to legislative requirements, safety procedures and workplace procedures, including implications for plant warranty or safety issues of:
  - not applying legislative requirements to job functions
  - not adhering to safety procedures and action to take when a breach of health, safety or other policy occurs
  - not involving customer or not referencing plant manufacturer's documentation before working on fixings, access holes or component location
- limitations of maintenance and repair activities that may be conducted by the service technician
- pre-engineered fire-suppression systems, including:
  - design, installation and commissioning requirements and limitations of the manufacturers' proprietary system
  - identification and purpose of the major components in the fire-suppression system for different manufacturers' proprietary systems
  - key installation design requirements for pre-engineered systems
  - manufacturers' requirements and standards applicable to design, installation, commissioning, inspecting, testing and maintaining a pre-engineered fire-suppression system
  - procedures for inspecting, testing and maintaining the system to verify operation to manufacturers' requirements
  - purpose of installing the system
  - purpose of fire-suppression systems
  - reasons for commissioning after installation
  - types of fire-extinguishing agents used in pre-engineered systems and their uses

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	This unit of competency could be assessed by observation of practical demonstrations of installing and commissioning a proprietary pre-engineered system, conducted at the customer's work site or simulated workplace.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the required skills and knowledge specified in this unit for at least one type of the pre-engineered fire-suppression system listed in the range statement.

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	In particular the person should demonstrate the ability to: • locate, interpret and apply relevant information, standards and specifications • comply with organisational policies and procedures, including quality requirements • communicate and work effectively and safely with others • conduct service operations according to customer, manufacturer and organisational requirements • install, commission and provide documentation on at least two complete systems according to the current Australian standard relevant to installation. Note: Evidence of the manufacturer's endorsement of installation and commissioning of installed systems to meet the current Australian standard must also be provided.
Context of and specific resources for assessment	Assessment of essential underpinning knowledge may be conducted in an off-site context. It is to comply with relevant regulatory or Australian standards' requirements. Resource implications for assessment include: • access to customer premises or a simulated workplace environment • assessment documentation • necessary tools, specialist equipment, manuals and relevant documentation • training and assessment record book.
Method of assessment	Assessment methods must: • satisfy the endorsed Assessment Guidelines of the Property Services Training Package • include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application • reinforce the integration of employability skills with workplace tasks and job roles • confirm that competency is verified and able to be transferred to other circumstances and environments.
Guidance information for assessment	Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support. Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of

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	the candidate in relation to the competency being assessed. This unit could be assessed on its own or in combination with other units relevant to the job function, for example: • CPPFES2027A Inspect, test and maintain non-gaseous pre-engineered fire-suppression systems.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Legislative and industry requirements may include:	• building surveyor requirements
	• manufacturers' system manuals
	• relevant legislation relating to installing and commissioning fire protection equipment, including:
	  • dangerous goods regulations
	  • environmental regulations
	  • licensing arrangements
	  • international shipping codes
	  • marine codes for different Australian States
	  • OHS legislation, codes and regulations
	• relevant commonwealth and state or territory building Acts, regulations or codes, such as Building Code of Australia (BCA)
	• relevant Australian standards, including:
	  • risk assessment section of AS 4360 Risk management
	  • note: Australian standards are frequently revised and users must always check for currency and amendments
	• system approval listing, such as:
	  • CSIRO ActivFire
	  • Factory Mutual (FM)
	  • Underwriters Laboratories (UL).

Organisational requirements may be located in quality assurance and procedures manuals relating to:	• documentation and information systems and processes • legal and organisational policies and guidelines, including personnel practices and guidelines outlining work roles, responsibilities and delegations • legislation relevant to service operation • OHS policies, procedures and programs • using electronic job scheduling and communication devices.

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Pre-engineered fire-suppression systems are:	• fire protection systems consisting of:
	  • supply of extinguishing agent of pre-determined quantity
	  • pipework with nozzle arrangement installed up to a maximum permitted design according to manufacturer's pre-engineered limitation requirements and applicable Australian standard (note: no hydraulic calculations are required to size pipework or nozzles)
	• fitted to a wide variety of fixed and mobile plant and equipment, such as:
	  • commercial cooking equipment, including:
	  • associated ducts and filters
	  • exhaust plenums
	  • exhaust systems
	  • fixed plant used in a range of industry sectors, such as mining, marine and power generation, including:
	  • engine bays
	  • fuel pumping skids
	  • generators
	  • industrial vehicles used in a range of industry sectors, such as mining, forestry and waste management, including:
	  • draglines
	  • earthmovers
	  • graders
	  • loaders
	  • trucks.

Checking for compliance may include:	• undertaking commissioning tests detailed in Australian standards and manufacturers' documentation to verify performance of an installed, repaired or altered piece of equipment or system
	• applying inspection, test and survey requirements to equipment or systems, according to Australian standards, to determine that they are:
	  • capable of operating as originally installed
	  • providing the coverage and protection needed to meet original design or performance requirements
	  • still suitable for the fire hazard or risk being protected, as no change in occupancy or use of the area protected has occurred since the equipment or system was installed or last modified
	• reviewing documentation to verify that the systems are installed according to legislative and industry requirements, such as:
	  • equipment listing
	  • relevant commonwealth and state or territory building Acts,

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	regulations and codes • relevant Australian standards listed for that system.
Action may include:	• advising customer • documenting non-compliance • making equipment safe • reporting, as required.
Extinguishing agents may include:	• foam • powder • water mist • wet chemical • combination of any of the above when compatible.
Customer requirements may include:	• confirming or varying service instructions • following sign-in and sign-out procedures for entry to or exit from premises • industry requirements • insurance requirements • providing non-routine or urgent services • providing routine services • providing written or verbal confirmation of services provided or future maintenance schedule • sighting work permits • system specifications.
System components may include:	• actuators • agent discharge nozzles • agent distribution, pipework and hoses • container valves • control equipment • detection devices • extinguishing agent containers, such as tanks and cylinders • support brackets.
Auxiliary shutdown may include:	• air conditioning shutdown signal to an electrical contactor to stop air conditioning • cooking fuel line shutdown signal to a gas solenoid valve on main inlet pipe supply to cooking appliances • cooking power supply shutdown signal to an electrical contactor to isolate main electrical supply to cooking appliances • vehicle or plant engine shutdown signal to engine emergency shutdown circuitry.
Documentation may include:	• certificates of inspection • corrective action reports • customer recommendation forms • equipment recommendation forms

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	• installation drawings and schedules • maintenance record systems • manufacturers' system documentation • product documentation • service agreements • service and maintenance manuals.
Commissioning procedures and tests may include:	• discharges • leaks • pressure • recharging • visual inspections.
Commissioning schedules may include:	• customer schedules • schedules in Australian standards • system manufacturer's schedules.

Unit Sector(s)

Fire protection equipment

Custom Content Section

Not applicable.

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CPPSEC2021A Install security equipment and systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to install a range of security equipment and systems. It requires the ability to select and use materials, tools and equipment to install security equipment and systems using approved termination methods and procedures. This work applies in extra low voltage as defined through the Australian Standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for installing networked security systems in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the installation of networked security systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for installation.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to installing ***security equipment and systems*** are identified and complied with. 1.2 ***Assignment instructions*** are obtained, reviewed and confirmed as required with ***relevant persons***. 1.3 Security equipment and system to be installed is identified and confirmed. 1.4 ***Tools***, ***equipment*** and ***materials*** needed to carry out the work are selected and checked for correct operation and safety. 1.5 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Install security equipment and system.	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements. 2.2 Security equipment and system is correctly positioned in accordance with installation specifications and assignment instructions. 2.3 Security equipment and system is securely fixed, terminated and connected to cabling using appropriate methods and procedures. 2.4 Security equipment and system is installed without damage or distortion to the surrounding environment or

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ELEMENT	PERFORMANCE CRITERIA
	services.
	2.5 Safe workplace practices are applied throughout installation process in accordance with OHS requirements.
	2.6 Changing circumstances and ***factors*** affecting the achievement of assignment instructions are identified and recommendations for variation to installation plans are approved by relevant persons.
3 Complete installation.	3.1 Installed security equipment and system is inspected to confirm operational effectiveness in accordance with assignment instructions.
	3.2 Checks are conducted to confirm that all terminations are electrically and mechanically sound.
	3.3 Work area is restored to original condition, waste disposed of and tools and equipment cleaned and stored in accordance with organisational requirements.
	3.4 Malfunctions, faults, wear or damage to tools or equipment is documented and reported for repair or replacement in accordance with organisational procedures.
	3.5 Notification of work completion is made to relevant persons in accordance with organisational procedures.
	3.6 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- apply safe and environmentally aware work practices
- carry out basic carpentry
- carry out soldering and drilling
- communicate in a clear and concise manner
- complete documentation
- estimate and organise materials, tools and equipment requirements
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and follow routine workplace safety procedures
- identify and report faulty equipment

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REQUIRED SKILLS AND KNOWLEDGE

- identify, terminate and connect cables
- install and fix a range of security equipment and systems
- organise and prioritise work tasks
- read and interpret plans and specifications
- restore work area to pre-installation condition
- solve routine problems
- test and confirm operational effectiveness of security equipment and system
- use suitable tools and equipment, including hand and power tools
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- cable identification, termination and connection procedures
- earthing systems arrangements and requirements
- electrical concepts
- emergency procedures
- installation methods and procedures relevant to security equipment and systems
- methods of fixing security equipment and systems
- methods of sealing cable entries
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working in a confined space
- risks and hazards associated with installation procedures
- safe workplace procedures
- technical terminology
- types, functions and features of security equipment and systems
- waste disposal procedures.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- applying appropriate methods and using suitable tools and equipment to position, fix and install a range of security equipment and systems
- cleaning and storing tools and equipment and reinstating work site to a clean and safe condition
- completing documentation related to installation
- interpreting and complying with all applicable legislative and licensing requirements and Australian Standards
- methodically organising own work tasks
- safely following installation procedures and carrying out checks to ensure integrity, security and safety of security equipment and system.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements and monitoring centre records.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures
- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess

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underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Legislative requirements may relate to:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian building codes and regulations
- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures

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- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

Security equipment and systems may include:

- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment and systems location and positioning information
- equipment, tools and material requirements
- personal protection clothing and equipment
- requirements reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - installation procedures
  - manufacturer's instructions
  - service and maintenance requirements
  - type
  - warranties and guarantees
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

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***Relevant persons* may include**:	• clients • colleagues • engineers and technicians • equipment and systems manufacturers • security consultants • security personnel • site managers or project managers • supervisor.
***Tools and equipment* may include**:	• cable testing equipment • communications equipment • consumable items, eg batteries • crimp tools • fixing tools • hand tools • IDS tools • ladder • multimeter • personal protection equipment • power tools • soldering iron • templates.

***Materials* may include**:	• electrical components
	• fixings
	  • saddles
	  • conduit
	  • loxins
	  • girderclips
	  • wall plugs
	  • hollow wall anchors
	  • silicon
	  • screws
	  • parts and components
	• insulation tape
	• sealing compounds
	• solder
	• wire and cable

***Risks and hazards* may relate to**:	• chemical hazards eg battery corrosion
	• exposed electrical wiring
	• exposure to
	  • asbestos
	  • building debris

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- dust
- glass fibre
- live power
- natural and other gas build-up
- noise
- vermin
- water

- manual handling
- non-compliance with building codes and regulations.

Occupational Health and Safety **(*OHS*) *requirements* may relate to**:

- emergency procedures
- following confined spaces procedures
- implementation of safety policies and procedures
  - chemicals, gas and vapour
  - isolation procedures
  - monitoring and testing procedures
  - use of personal protection equipment and clothing
  - work clearance procedures
- risk and hazard recognition
- safety training
- working with electrical wiring and cables
- working with tools and equipment.

Personal protection equipment **may include**:

- breathing apparatus
- fire extinguisher
- first aid kit
- gloves
- head protection
- hearing protection
- knee pads
- masks
- safety boots
- safety glasses
- warning signs and tapes
- witches hats.

Factors may relate to:

- budget constraints
- codes of practice
- environment eg time, weather
- health, safety and welfare
- non-availability of resources and materials
- regulations and limitations
- risks and hazards
- site conditions

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***Documentation* may include**:	• technology, tools or equipment breakdowns. • adjustments to original installation plan • faulty or malfunctioning tools and equipment • materials used, parts and components replaced • security equipment and system positioning • testing and inspection results • written and electronic reports.

Unit Sector(s)

Unit sector Security

Competency field

Competency field Technical security

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CPPSEC3036A Program security equipment and system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to program a range of security equipment and systems. It requires the ability to accurately determine configuration parameters and program security equipment and systems to meet client requirements. This work applies in extra low voltage as defined through the Australian standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for programming security equipment and systems in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the programming of security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for programming.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with. 1.2 Assignment instructions are obtained, reviewed and confirmed as required with ***relevant persons***. 1.3 ***Security equipment and system*** to be configured and programmed is identified and confirmed. 1.4 Programming requirements and configuration parameters appropriate to the security equipment and system are confirmed and clarified as required. 1.5 ***Tools***, ***equipment and materials*** needed to carry out the work are selected and checked for correct operation and safety. 1.6 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Program security equipment and system.	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements. 2.2 Security equipment and system is powered, programmed and configured in accordance with assignment instructions. 2.3 Correct operational procedures and compliance requirements are observed and followed in accordance

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ELEMENT	PERFORMANCE CRITERIA
	with manufacturer's instructions.
	2.4 Configuration of security equipment and system is tested and checked using approved procedures.
	2.5 Required adjustments to programming instructions are determined and confirmed with relevant persons.
	2.6 Safe workplace practices are applied throughout programming process in accordance with OHS requirements.
3 Complete programming activities.	3.1 Programmed security equipment and system is inspected to confirm operational effectiveness and conformance with assignment instructions.
	3.2 Work area is restored to original condition, waste disposed of and tools and equipment cleaned and stored in accordance with organisational requirements.
	3.3 Malfunctions, faults, wear or damage to tools or equipment is documented and reported for repair or replacement in accordance with organisational procedures.
	3.4 Notification of work completion is made to relevant persons in accordance with organisational procedures.
	3.5 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- accurately identify and handle cables
- apply safe and environmentally aware work practices
- communicate in a clear and concise manner
- complete documentation
- download and upload digital information
- estimate and organise materials, tools and equipment requirements
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and follow routine workplace safety procedures
- identify and report faulty equipment

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REQUIRED SKILLS AND KNOWLEDGE

- operate security equipment and systems
- organise and prioritise work tasks
- power security systems
- program and configure security equipment and systems
- read a multimeter
- read and interpret plans and specifications
- solve routine problems
- test security equipment and systems
- use suitable tools and equipment, including hand and power tools
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- building construction methods and types
- cable identification methods and techniques
- earthing systems arrangements and requirements
- electrical concepts
- emergency procedures
- keypad and control panel types and functions
- methods of equipment and system programming
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- procedures to power systems
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working at height and in a confined space
- risks and hazards associated with programming procedures
- safe workplace procedures
- technical terminology
- types and functions of computer software
- types of security equipment and system configurations
- types, functions and features of security equipment and systems
- waste disposal procedures.

Evidence Guide

EVIDENCE GUIDE

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The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- interpreting and complying with all applicable legislative and licensing requirements for programming work
- accessing security equipment and systems with minimal disruption to client, services or normal work routines
- accurately determining programming requirements and configuration parameters of security equipment and systems
- applying appropriate methods to program and configure security equipment and systems
- cleaning and storing tools and equipment and reinstating work site to a clean and safe condition
- following safe and efficient work practices in the use of tools and equipment and managing risks and hazards in the work area
- organising own work tasks within specified programming timeframes and completing documentation related to programming services
- carrying out checks to ensure the integrity, security and safety of security equipment and system.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures

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- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian building codes and regulations
- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice

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- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment, tools and material requirements
- equipment and system location information
- personal protection clothing and equipment requirements
- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - installation procedures
  - manufacturer's instructions
  - service and maintenance requirements
  - type
  - warranties and guarantees
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

***Relevant persons* may include**:

- clients
- colleagues
- engineers and technicians
- equipment and systems manufacturers
- security consultants
- security personnel

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- site managers or project managers
- supervisor.

Security equipment and systems may include:

- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

Security systems may be:

- computerised
- electronic
- mechanical
- procedural.

***Tools, equipment and materials* may include**:

- cable testing equipment
- communications equipment
- computer disks
- crimp tools
- hand tools
- ladder
- multimeter
- personal protection equipment
- power tools
- templates.

***Risks and hazards* may relate to**:

- chemical hazards eg battery corrosion
- exposed electrical wiring
- exposure to:
  - asbestos
  - building debris
  - dust
  - glass fibre
  - live power
  - natural and other gas build-up
  - noise
  - vermin
  - water

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	• manual handling • non-compliance with building codes and regulations.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:	• emergency procedures
	• following confined spaces procedures
	• implementation of safety policies and procedures
	  • chemicals, gas and vapour
	  • isolation procedures
	  • monitoring and testing procedures
	  • use of personal protection equipment and clothing
	  • work clearance procedures
	• risk and hazard recognition
	• safety training
	• working with electrical wiring and cables
	• working with tools and equipment.

***Personal protection equipment* may include**:	• breathing apparatus • fire extinguisher • first aid kit • gloves • head protection • hearing protection • knee pads • masks • safety boots • safety glasses. • warning signs and tapes • witches hats.
***Documentation* may include**:	• adjustments to original cable plan • faulty or malfunctioning tools and equipment • materials used • security equipment and system positioning • testing and inspection results • work activity report • written and electronic reports.

Unit Sector(s)

Unit sector	Security

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Competency field

Competency field Technical security

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CPPSEC3037A Test installed security equipment and system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to test a range of security equipment and systems including cable systems, equipment components and programming. It requires the ability to select and carry out tests suitable to confirm the integrity, security and safety of the security equipment and system. This work applies in extra low voltage as defined through the Australian Standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for testing security systems and equipment in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the testing of security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for testing.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with. 1.2 Assignment instructions are obtained, reviewed and confirmed as required with ***relevant persons***. 1.3 ***Security equipment and system*** to be ***tested*** is identified and confirmed. 1.4 Testing parameters appropriate to the security equipment and system are confirmed in accordance with manufacturer's instructions. 1.5 ***Tools***, ***equipment and materials*** needed to carry out the work are selected and checked for correct operation and safety. 1.6 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Test security equipment and system.	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements. 2.2 Parts or connections of security equipment and system are removed in accordance with approved procedures and safely stored to protect against loss or damage. 2.3 Tests are conducted in accordance with approved procedures and manufacturer's instructions.

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ELEMENT	PERFORMANCE CRITERIA
	2.4 Tests provide reliable and accurate test data on the operation and functioning of security equipment and system.
	2.5 Security equipment and system is reassembled and returned to pre-test condition in accordance with manufacturer's instructions.
	2.6 Safe workplace practices are applied throughout programming process in accordance with OHS requirements.
	2.7 Personal limitations in conducting testing procedures are identified and assistance is sought from relevant persons in accordance with organisational procedures.
3 Complete testing.	3.1 Security equipment and system is checked to confirm operational effectiveness.
	3.2 Operational errors or deficiencies in security equipment and system is documented and reported in accordance with organisational procedures.
	3.3 Test results are accurately recorded and processed in accordance with organisational procedures.
	3.4 Work area is restored to original condition, waste disposed of and tools and equipment cleaned and stored in accordance with organisational requirements.
	3.5 Malfunctions, faults, wear or damage to tools or equipment is documented and reported for repair or replacement in accordance with organisational procedures.
	3.6 Notification of work completion is made to relevant persons in accordance with organisational procedures.
	3.7 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- accurately identify and handle cables
- apply safe and environmentally aware work practices
- communicate in a clear and concise manner

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REQUIRED SKILLS AND KNOWLEDGE

- complete documentation
- download and upload digital information
- estimate and organise materials, tools and equipment requirements
- evaluate test results
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and follow routine workplace safety procedures
- identify and report faulty equipment
- identify, isolate, test and tag cables
- operate security equipment and systems
- organise and prioritise work tasks
- power security systems
- read a multimeter
- read and interpret plans and specifications
- solve routine problems
- test security equipment and systems
- use keypads and control panels
- use suitable tools and equipment, including hand and power tools and testing devices
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- building construction methods and types
- cable identification methods and techniques
- circuit protection requirements
- earthing systems arrangements and requirements
- electrical concepts
- electrical connections and types of electrical circuits
- emergency procedures
- isolating and testing procedures
- keypad and control panel types and functions
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- procedures to power systems
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working at height and in a confined space
- risks and hazards associated with programming procedures
- safe workplace procedures

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REQUIRED SKILLS AND KNOWLEDGE

- technical terminology
- types and functions of computer software
- types of security equipment and system configurations
- types, functions and features of security equipment and systems
- types, functions and features of tools and equipment including testing devices
- waste disposal procedures.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- determining testing parameters appropriate to type of security equipment and system and accurately interpreting test results
- following safe and efficient work practices in the use of tools and equipment and managing risks and hazards in the work area
- interpreting and complying with applicable legislative and licensing requirements for testing work
- organising own work tasks within specified testing timeframes and completing documentation related to testing services
- using appropriate methods and approved procedures to disassemble and reassemble components of security equipment and system
- cleaning and storing tools and equipment and reinstating work site to a clean and safe condition
- using appropriate procedures to carrying out tests to check and confirm security equipment and system performance and operational effectiveness.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and

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procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures
- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may**

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety

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relate to:

- environmental issues
- equal employment opportunity
- industrial relations
- anti-discrimination and diversity
- Australian building codes and regulations
- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment and system location information
- equipment, tools and material requirements
- personal protection clothing and equipment requirements
- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - installation procedures
  - manufacturer's instructions

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- service and maintenance requirements
- type
- warranties and guarantees
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

***Relevant persons* may include**:

- clients
- colleagues
- engineers and technicians
- equipment and systems manufacturers
- security consultants
- security personnel
- site managers or project managers
- supervisor.

Security equipment and systems may include:

- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

Security systems may be:

- computerised
- electronic
- mechanical
- procedural.

Tests may involve:

- alarm tests
- calibration tests
- correct relaying of information and data
- coverage tests
- detection tests
- functional tests
- safety tests
- testing of cables
- testing of wiring and connections:

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- continuity
- resistance
- earth leakage
- voltage

- testing to specifications
- walk tests.

Tools**, **equipment and materials **may include**:

- cable testing equipment
- communications equipment
- computers and computer software
- crimp tools
- hand tools
- ladder
- multimeter
- personal protection equipment
- power tools
- templates
- test board
- test tape.

Risks and hazards **may relate to**:

- chemical hazards eg battery corrosion
- exposed electrical wiring
- exposure to:
  - asbestos
  - building debris
  - dust
  - glass fibre
  - live power
  - natural and other gas build-up
  - noise
  - vermin
  - water
- manual handling
- non-compliance with building codes and regulations.

Occupational Health and Safety** (**OHS**) **requirements **may relate to**:

- emergency procedures
- following confined spaces procedures
- implementation of safety policies and procedures:
  - chemicals, gas and vapour
  - isolation procedures
  - monitoring and testing procedures
  - use of personal protection equipment and clothing
  - work clearance procedures

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- risk and hazard recognition
- safety training
- working with electrical wiring and cables
- working with tools and equipment.

***Personal protection equipment* may include**:

- breathing apparatus
- fire extinguisher
- first aid kit
- gloves
- head protection
- hearing protection
- knee pads
- masks
- safety boots
- safety glasses.
- warning signs and tapes
- witches hats.

***Documentation* may include**:

- adjustments to original cable plan
- cable identification records
- faulty or malfunctioning tools and equipment
- location of security equipment and system
- materials used
- testing and inspection results
- work activity report
- written and electronic reports.

Unit Sector(s)

Unit sector Security

Competency field

Competency field Technical security

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CPPSEC3038A Commission and decommission security equipment and system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to commission and decommission a range of security equipment and systems. It requires the ability to apply appropriate procedures and use suitable tools and equipment to commission and decommission security equipment and systems. This work applies in extra low voltage as defined through the Australian standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for commissioning and decommissioning security systems and equipment in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for commissioning or decommissioning activities.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with. 1.2 Assignment instructions are obtained, reviewed and confirmed as required with ***relevant persons***. 1.3 ***Security equipment and system*** to be ***commissioned*** or ***decommissioned*** is identified and confirmed. 1.6 ***Tools***, ***equipment and materials*** needed to carry out the work are selected and checked for correct operation and safety. 1.7 ***Site access and specific site requirements*** are confirmed and organised in accordance with organisational procedures. 1.8 Appropriate ***interpersonal techniques*** are used to consult with relevant persons to ensure the work is coordinated effectively with others in the work area. 1.9 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Commission security equipment and	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements.

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ELEMENT	PERFORMANCE CRITERIA
system.	2.2 Security equipment and system is accessed with minimal disruption to surrounding environment and services. 2.3 Equipment interconnections and parameters are confirmed in accordance with system specifications. 2.4 ***Customisation*** of security equipment and system to meet assignment instructions is conducted in accordance with approved procedures. 2.5 Non-software configurations are set and confirmed and software is installed and hardware data loaded in accordance with manufacturer's instructions. 2.6 Performance tests are conducted to ensure security equipment and system operation meets prescribed parameters and specifications. 2.7 Malfunctions or deviations from recommended specifications are documented and reported. 2.8 ***Hand-over*** of commissioned security equipment and system is conducted in accordance with organisational procedures. 2.9 Safe workplace practices are applied throughout programming process in accordance with OHS requirements.
3 Decommission security equipment and system.	3.1 Personal protection equipment is selected and used in accordance with OHS requirements. 3.2 Security equipment and system is accessed with minimal disruption to surrounding environment and services. 3.3 Isolation procedures to protect the operation of existing services are confirmed with relevant persons and implemented in accordance with manufacturer's instructions. 3.4 Sources of energy are safely terminated in accordance with manufacturer's instructions. 3.5 Security equipment and system components are ***removed*** in accordance with approved procedures and manufacturer's instructions. 3.6 Clear and concise communication is maintained with relevant persons during decommissioning procedures in accordance with organisational procedures. 2.7 Safe workplace practices are applied throughout programming process in accordance with OHS requirements.
4 Complete commissioning and	4.1 Work is completed in an efficient and effective manner within designated timeframes. 4.2 ***Results of commissioning*** are documented and processed

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ELEMENT	PERFORMANCE CRITERIA
decommissioning activities.	in accordance with organisational procedures. 4.3 Notification of work completion is made in accordance with organisational procedures. 4.4 Work area is cleaned and restored in accordance with organisational procedures. 4.5 ***Disposal*** of decommissioned security equipment and system or components is arranged in accordance with site and organisational procedures. 4.6 Waste from commissioning and decommissioning procedures is collected, treated and disposed of in accordance with organisational procedures. 4.7 All relevant ***documentation*** is completed and securely maintained with due regard to confidentiality in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- accurately identify and correctly handle cables
- communicate in a clear and concise manner
- confirm systems are ready to be commissioned
- confirm that systems and their performance meet the required operational specification
- customise equipment and systems to client requirements
- demonstrate the operation of systems during hand-over
- download and upload digital information
- effectively operate a range of security systems and networks
- estimate and organise resource requirements
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and follow routine workplace safety procedures
- identify and report faulty equipment
- methodically prioritise and organise work tasks
- minimise disruption to surrounding work activities
- read and interpret plans and specifications

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REQUIRED SKILLS AND KNOWLEDGE

- safely disable security equipment and systems
- select and use suitable tools and equipment
- solder, weld and carry out basic carpentry
- solve routine problems
- source relevant commissioning and decommissioning information
- test security equipment systems and read a multimeter.
- use keypads and control panels
- use suitable tools and equipment, including hand and power tools and testing devices
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- building construction methods and types
- cable identification methods and techniques
- circuit protection requirements
- earthing systems arrangements and requirements
- electrical concepts
- electrical connections and types of electrical circuits
- emergency procedures
- isolating and testing procedures
- keypad and control panel types and functions
- methods and procedures to commission and decommission security equipment and systems
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working at height and in a confined space
- risks and hazards associated with commissioning and decommissioning procedures
- safe workplace procedures
- technical terminology
- types and functions of computer software
- types, functions and features of security equipment and systems
- types, functions and features of tools and equipment including testing devices
- waste disposal procedures.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- accessing security equipment and systems and methodically carrying out commissioning and decommissioning procedures with minimal disruption to client services, existing structures or normal work routines
- clearly identifying commissioning and decommissioning requirements of security equipment and systems from assignment instructions and organising appropriate tools, equipment and materials to carry out work
- following safe and efficient work practices in the use of tools and equipment and accurately identifying and managing risks and hazards in the work area
- handing over security equipment and system to client ensuring a full and complete understanding of systems and network operations and functions through the provision of clear and effective instructions, information and training
- reinstating work area to a clean and safe condition, and preparing and submitting all required documentation in an accurate and prompt manner.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

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Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures
- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian building codes and regulations
- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection

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- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment and system location information
- equipment, tools and material requirements
- personal protection clothing and equipment requirements
- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - installation procedures
  - manufacturer's instructions
  - service and maintenance requirements
  - type
  - warranties and guarantees
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

***Relevant persons* may include**:

- clients
- colleagues

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- engineers and technicians
- equipment and systems manufacturers
- security consultants
- security personnel
- site managers or project managers
- supervisor.

Security equipment and systems may include:

- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

Security systems may be:

- computerised
- electronic
- mechanical
- procedural.

***Commission requirements* may relate to**:

- customisation requirements
- hand over information and documentation
- monitoring and response procedures
- scheduling of commissioning
- training requirements
- type, functions and features of equipment and system.

***Decommissioning* may involve**:

- adjustments to equipment and system
- changes to hardware and software
- default system-held information
- disablement
- disconnection
- downloading system information
- reconnecting components
- removal of components.

***Tools*, *equipment and materials* may include**:

- cable testing equipment
- communications equipment
- computer disks
- computer leads and cables

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- computers and computer software
- crimp tools
- drop sheet
- file
- fixing tools
- flexible rods
- hand tools
- hand-held programmers
- insulation mega
- interface PCBs
- keypads
- ladder
- multimeter
- personal protection equipment
- power tools
- router
- soldering iron
- spirit level
- strippers
- templates
- welder.

***Site access and specific site requirements* may relate to**:

- access and egress points
- access codes, keys or passes
- building codes and regulations
- obtaining security clearance
- OHS requirements
- time of access to site
- union requirements.

Interpersonal techniques may involve:

- active listening
- being non-judgemental
- being respectful and non-discriminatory
- constructive feedback
- control of tone of voice and body language
- culturally aware and sensitive use of language and concepts
- demonstrating flexibility and willingness to negotiate
- effective verbal and non-verbal communication
- maintaining professionalism
- providing sufficient time for questions and responses
- reflection and summarising
- two-way interaction
- use of plain English

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- use of positive, confident and cooperative language.

***Risks and hazards* may relate to**:

- chemical hazards eg battery corrosion
- exposed electrical wiring
- exposure to:
  - asbestos
  - building debris
  - dust
  - glass fibre
  - live power
  - natural and other gas build-up
  - noise
  - vermin
  - water
- manual handling
- non-compliance with building codes and regulations.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:

- emergency procedures
- following confined spaces procedures
- implementation of safety policies and procedures:
  - chemicals, gas and vapour
  - isolation procedures
  - monitoring and testing procedures
  - use of personal protection equipment and clothing
  - work clearance procedures
- risk and hazard recognition
- safety training
- working with electrical wiring and cables
- working with tools and equipment.

***Personal protection equipment* may include**:

- breathing apparatus
- fire extinguisher
- first aid kit
- gloves
- head protection
- hearing protection
- knee pads
- masks
- safety boots
- safety glasses.
- warning signs and tapes
- witches hats.

***Customisation* may**

- adding system functions

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relate to:
- changing password or user code
- changing volume or length of alarms
- modifying system functions.

***Hand-over* procedures may involve**:
- a comprehensive explanation and demonstration of security equipment and system operations and functions
- clear instructions on security equipment and system maintenance
- effective user training:
  - demonstration
  - practice
  - question and answer session
  - verbal and written explanations
- provision of all relevant information and documentation:
  - company contact details
  - keying plan
  - maintenance requirements
  - manufacturer's instructions and user manuals
  - monitoring procedures
  - warranty requirements.

***Removal* procedures may involve**:
- disconnection
- dismantling
- reconnecting components
- removal.

***Results of commissioning* may include**:
- customisation of equipment and system
- date and time of commissioning
- information and documentation provided to client during hand-over
- persons equipment and system commissioned to
- type of commissioning undertaken.

***Disposal* may involve**:
- destruction
- return to client
- return to manufacturer
- return to store
- special disposal requirements for hazardous components eg radioactive components and batteries
- special storage or disposal requirements for classified or high security equipment and systems.

***Documentation* may include**:
- adjustments made to security equipment and system
- cable identification records
- client authorisations
- faulty or malfunctioning tools and equipment

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- location of security equipment and system
- materials used
- records of decommissioning procedures
- results of commissioning
- testing and inspection results
- work activity report
- written and electronic reports.

Unit Sector(s)

Unit sector Security

Competency field

Competency field Technical security

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CPPSEC3039A Identify and diagnose electronic security equipment and system fault

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to identify and diagnose faults in electronic security equipment and systems. It requires the ability to conduct fault-finding inspections and checks against normal operational performance and identify and diagnose faults. This work applies in extra low voltage as defined through the Australian Standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for inspecting and testing security systems and equipment in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the inspection and testing of security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for diagnosis of faults.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with.
	1.2 Assignment instructions and other ***relevant information*** is obtained and reviewed.
	1.3 Appropriate ***interpersonal techniques*** are used to consult with ***relevant persons*** to determine extent of ***faults***.
	1.4 Normal operational functions and performance parameters of ***security equipment and system*** are confirmed against specifications.
	1.5 ***Tools***, ***equipment and materials*** are organised and checked for correct operation and safety.
	1.6 ***Site access and specific site requirements*** are identified and confirmed with relevant persons in accordance with organisational procedures.
	1.7 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Diagnose faults.	2.1 Suitable ***personal protection equipment*** is selected, used and maintained in accordance with OHS and organisational requirements

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ELEMENT	PERFORMANCE CRITERIA
	2.2 Equipment and system isolation requirements are complied with in accordance with OHS guidelines.
	2.3 Networked security system components are checked and tested for operational performance in accordance with manufacturer's instructions.
	2.4 Logical diagnostic and ***systematic fault-finding methods*** are applied to diagnose faults employing measurements and estimations of system operating parameters.
	2.5 Suspected fault scenarios are tested as being the source of system problems.
	2.6 Faults are diagnosed on the basis of an accurate assessment of test results, historical information and ***operational data***.
	2.7 Specialist advice is sought as required to assist with fault diagnosis in accordance with organisational procedures.
3 Complete and report diagnosis.	3.1 Findings of fault diagnosis are documented and presented to relevant persons in accordance with organisational procedures.
	3.2 Recommendations include options for fault rectification and are supported by verifiable data.
	3.3 Presented information uses clear and concise language and meets organisational standards for style, format and accuracy.
	3.4 Complex faults are referred for specialist advice in accordance with organisational procedures.
	3.5 Work area is cleaned and restored in accordance with organisational procedures.
	3.6 Waste is collected, treated and disposed of in accordance with organisational procedures.
	3.7 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- accurately identify and diagnose faults

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REQUIRED SKILLS AND KNOWLEDGE

- accurately identify and handle cables
- communicate in a clear and concise manner
- complete documentation
- demonstrate basic logic and lateral thinking processes
- download and upload digital information
- estimate and organise materials, tools and equipment requirements
- evaluate test results
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and follow routine workplace safety procedures
- identify and report faulty equipment
- operate security equipment and systems
- organise and prioritise work tasks
- read a multimeter
- read and interpret plans and specifications
- solve routine problems
- test security equipment and systems
- use keypads and control panels
- use suitable tools and equipment, including hand and power tools and testing devices
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- basics of circuit diagrams
- building construction methods and types
- cable identification methods and techniques
- circuit protection requirements
- common equipment and system faults
- earthing systems arrangements and requirements
- electrical concepts
- emergency procedures
- fault-finding techniques
- isolating and testing procedures
- keypad and control panel types and functions
- operational principles of data transmission networks
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards

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REQUIRED SKILLS AND KNOWLEDGE

- requirements for working at height and in a confined space
- risks and hazards associated with working with security equipment and systems
- safe workplace procedures
- technical terminology
- tests to confirm equipment and system operation
- types and functions of computer software
- types of security equipment and system configurations
- types, functions and features of security equipment and systems
- types, functions and features of tools and equipment including testing devices
- waste disposal procedures.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of: • ascertaining normal performance of security equipment and systems against specification schedules • cleaning and storing tools and equipment, reinstating work area in a clear and safe condition, and updating and submitting all required documentation in an accurate and prompt manner • conducting inspections and tests of security equipment and systems in a methodical manner and accurately identifying and diagnosing faults based on an assessment of test data, site variables, operational and historical information • following safe and efficient work practices in the use of tools and equipment and effectively managing risks and hazards in the work area • organising appropriate tools, equipment and materials to carry out checks and testing of a range of security equipment and systems • preparing and presenting accurate and concise documentation detailing fault diagnosis and repair recommendations based on verifiable data.
Context of and specific	Context of assessment includes:

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resources for assessment	• a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement. Resource implications for assessment include: • access to plain English version of relevant statutes and procedures • access to a registered provider of assessment services • access to a suitable venue and equipment • assessment instruments including personal planner and assessment record book • work schedules, organisational policies and duty statements. Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.
Method of assessment	This unit of competency could be assessed using the following methods of assessment: • observation of processes and procedures • questioning of underpinning knowledge and skills.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge. Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical. Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

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situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian building codes and regulations
- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment and system location information
- equipment, tools and material requirements
- personal protection clothing and equipment requirements

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- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - installation procedures
  - manufacturer's instructions
  - service and maintenance requirements
  - type
  - warranties and guarantees
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

***Relevant information* may relate to**:

- historical performance information
- operational data
- site variables:
  - equipment and system usage
  - environmental conditions
  - building structures
  - client habits.

Interpersonal techniques may involve:

- active listening
- being non-judgemental
- being respectful and non-discriminatory
- constructive feedback
- control of tone of voice and body language
- culturally aware and sensitive use of language and concepts
- demonstrating flexibility and willingness to negotiate
- effective verbal and non-verbal communication
- maintaining professionalism
- providing sufficient time for questions and responses
- reflection and summarising
- two-way interaction
- use of plain English
- use of positive, confident and cooperative language.

***Relevant persons* may include**:

- clients
- colleagues
- engineers and technicians
- equipment and systems manufacturers
- security consultants
- security personnel
- site managers or project managers

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- supervisor.

***Faults* may be**:

- due to operational misuse
- due to previous installation
- electronic
- environmental
- mechanical
- procedural
- software-related.

Security equipment and systems may include:

- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

Security systems may be:

- computerised
- electronic
- mechanical
- procedural.

***Tools*, *equipment and materials* may include**:

- cable testing equipment
- circuit board cleaner
- communications equipment
- computer cables and leads
- computers and computer software including back-up disks
- crimp tools
- drop sheet
- file
- glass break tester
- hand tools
- interface PCBs
- ladder
- multimeter
- personal protection equipment
- power tools
- routers
- spirit level.

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***Site access and specific site requirements* may relate to**:	• access and egress points • access codes, keys or passes • building codes and regulations • heritage requirements • noise control • obtaining security clearance • OHS requirements • time of access to site • union requirements.

***Risks and hazards* may relate to**:	• chemical hazards eg battery corrosion
	• exposed electrical wiring
	• exposure to:
	  • asbestos
	  • building debris
	  • dust
	  • glass fibre
	  • live power
	  • natural and other gas build-up
	  • noise
	  • vermin
	  • water
	• manual handling
	• non-compliance with building codes and regulations.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:	• emergency procedures
	• following confined spaces procedures
	• implementation of safety policies and procedures:
	  • chemicals, gas and vapour
	  • isolation procedures
	  • monitoring and testing procedures
	  • use of personal protection equipment and clothing
	  • work clearance procedures
	• risk and hazard recognition
	• safety training
	• working with electrical wiring and cables
	• working with tools and equipment.

***Personal protection equipment* may include**:	• breathing apparatus • fire extinguisher • first aid kit • gloves • head protection

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	• hearing protection • knee pads • masks • safety boots • safety glasses • warning signs and tapes • witches hats.
***Systematic fault-finding* methods may involve**:	• identifying fault in shortest time possible • progressively isolating fault • reviewing all available information • using a methodical approach • using testing equipment • verifying continued existence of problem.
Operational data may be found in:	• back-up information • central monitoring station records • maintenance documentation • manufacturer's instructions • software records • visual inspections.
***Documentation* may include**:	• faulty or malfunctioning tools and equipment • location of security equipment and system • materials used • recommendations for repair • security equipment and system faults • testing and inspection results • warranty conditions • work activity report • written and electronic reports.

Unit Sector(s)

Unit sector Security

Competency field

Competency field Technical security

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CPPSEC3041A Maintain and service security equipment and system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to carry out routine servicing of a range of security equipment, systems, plant and equipment. It requires the ability to identify maintenance requirements, follow correct procedures, use safe and efficient work practices, maintain a hazard-free work area, accurately document and maintain information systems. This work applies in extra low voltage as defined through the Australian standards AS 2201 (1986) environments.

This unit may form part of the licensing requirements for persons responsible for maintaining security equipment and systems in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the maintenance of security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Not Applicable

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for maintenance.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with. 1.2 Assignment instructions are obtained, reviewed and confirmed as required with ***relevant persons***. 1.3 ***Maintenance*** requirements of ***security equipment and system*** are confirmed. 1.4 Security equipment and systems to be inspected and serviced are identified and confirmed. 1.5 ***Tools***, ***equipment and materials*** needed to carry out the work are selected and checked for correct operation and safety. 1.6 Faulty or unsafe tools are identified and segregated for repair or replacement in accordance with organisational procedures. 1.7 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.

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ELEMENT	PERFORMANCE CRITERIA
2 Carry out service of security equipment and systems.	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements. 2.2 Security equipment and system identified for maintenance is ***accessed*** with minimal ***disruption*** to services and others in the work area. 2.3 Inspections and checks are conducted to identify any damage, obstruction or component wear. 2.4 Routine servicing of security equipment and system is carried out in accordance with manufacturer's instructions. 2.5 Common faults in security equipment and system are diagnosed and appropriate adjustments made in accordance with manufacturer's instructions. 2.6 Complex faults and repair requirements are identified and reported for specialist attention.
3 Complete maintenance activities.	3.1 Serviced security equipment and system is checked and confirmed for correct operation and serviceability. 3.2 Work area is restored and tools and equipment are cleaned, maintained and stored in accordance with organisational procedures. 3.3 Waste from service activities is collected, treated and disposed of or recycled in accordance with organisational procedures. 3.4 Malfunctions, faults, wear or damage to tools or equipment is documented and reported for repair or replacement in accordance with organisational procedures. 3.5 Notification of work completion is made to relevant persons in accordance with organisational procedures. 3.6 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- apply safe and environmentally aware work practices
- carry out maintenance of a range of security equipment and systems
- communicate in a clear and concise manner

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REQUIRED SKILLS AND KNOWLEDGE

- complete documentation
- estimate and organise materials, tools and equipment requirements
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and diagnose faults and malfunctions
- identify and follow routine workplace safety procedures
- maintain an inventory of equipment and consumables associated with maintenance activities
- measure and calculate volumes, consumption and servicing requirements
- read and interpret a multimeter
- read and interpret plans and specifications
- recognise routine and complex faults and malfunctions of a range of security equipment and systems
- solve routine problems
- test and confirm operational effectiveness of security equipment and systems
- use suitable tools and equipment, including hand and power tools
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- cable identification, termination and connection procedures
- common security equipment and system faults
- earthing systems arrangements and requirements
- electrical concepts
- emergency procedures
- equipment calibration requirements
- fault-finding techniques
- maintenance schedules and procedures relevant to security equipment and systems
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- reporting and documentation requirements
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working in a confined space
- risks and hazards associated with maintenance procedures
- safe workplace procedures
- technical terminology
- tests to confirm security equipment and system operation
- types of faults associated with security equipment and systems
- types, functions and features of security equipment and systems
- waste disposal procedures.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- accessing security equipment and system functioning with minimal disruption to others in the work area and normal services
- accurately diagnosing and rectifying security equipment and system irregularities and referring complex faults for specialist advice
- applying appropriate methods and using suitable tools and equipment to carry out maintenance of a range of security equipment and systems
- cleaning and storing tools and equipment and reinstating work site to a clean and safe condition
- organising own work tasks within specified maintenance timeframes and completing documentation related to maintenance services
- determining and implementing maintenance strategies and support processes to maintain the continuity of operations
- interpreting and complying with all applicable legislative and licensing requirements.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

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Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures
- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian building codes and regulations

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- Australian Communications Authority cabling standards
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment, tools and material requirements
- personal protection clothing and equipment requirements
- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - manufacturer's instructions
  - service and maintenance requirements
  - warranties and guarantees
- security equipment and system location information
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

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***Relevant persons* may include**:	• clients • colleagues • engineers and technicians • equipment and systems manufacturers • security consultants • security personnel • site managers or project managers • supervisor.
Maintenance may include:	• back-ups • changing user codes • cleaning • confirmation of operational effectiveness • identification and replacement of worn parts • inspections • lubrication • minor modifications and adjustments • servicing.
Security equipment and systems may include:	• access control systems • audible and visual warning devices • cameras and monitors • commercial and residential alarm systems • detection devices • electric and mechanical fire safety and fire locking systems • electronic locks and locking systems • electronic readers • electronic screen equipment • intercoms and control panels • security doors and door controls • specialised access control systems eg biometrics.
***Tools*, *equipment and materials* may include**:	• cable testing equipment • communications equipment • computer and software • diagnostics and testing equipment eg multimeter • extension cords • fixing tools • generators • hand tools • installation tools • ladder • materials:

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- cable
- fixings
- grease
- patch materials
- screws
- sealants
- wiring
- solder

- personal protection equipment
- power tools
- staple guns
- torches and lighting.

***Risks and hazards* may relate to**:

- chemical hazards eg battery corrosion
- exposed electrical wiring
- exposure to:
  - asbestos
  - building debris
  - dust
  - glass fibre
  - live power
  - natural and other gas build-up
  - noise
  - vermin
  - water
- manual handling
- non-compliance with building codes and regulations.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:

- emergency procedures
- following confined spaces procedures
- implementation of safety policies and procedures:
  - chemicals, gas and vapour
  - isolation procedures
  - monitoring and testing procedures
  - use of personal protection equipment and clothing
  - work clearance procedures
- risk and hazard recognition
- safety training
- working with electrical wiring and cables
- working with tools and equipment.

***Personal protection equipment* may**

- breathing apparatus
- fire extinguisher

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include:

- first aid kit
- gloves
- head protection
- hearing protection
- knee pads
- masks
- safety boots
- safety glasses.
- warning signs and tapes
- witches hats.

***Access* may relate to**:

- disablement of system
- modem access
- phone line access
- removal of housing
- use of access code
- use of access token
- use of keys.

***Disruptions* may affect**:

- access
- business operations
- noise
- security
- time
- use of equipment.

***Documentation* may include**:

- adjustments, modifications and servicing undertaken
- faulty or malfunctioning tools and equipment
- materials used, parts and components replaced
- operational checks and maintenance conducted
- recommended repairs or disposal of equipment
- security equipment and system faults and diagnosis
- testing and inspection results
- warranty conditions
- written and electronic reports.

Unit Sector(s)

Unit sector Security

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Competency field

Competency field Technical security

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CPPSEC3047A Provide estimate and quote on security system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to provide an estimate and quote on security systems to clients. It requires the ability to identify client security requirements and prepare an accurate quote which provides full details of security equipment and system provisions. It also requires an ability to interpret plans, designs and specifications and calculate labour and material costs.

This unit may form part of the licensing requirements for persons engaged in the provision and installation of security equipment or systems in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application to a range of technical security work roles in the security industry. Work is performed under limited supervision and competency requires some judgement and decision-making. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Identify client requirements.	1.1 Security ***assessment*** is undertaken to identify client requirements in accordance with organisational procedures. 1.2 ***Security system*** and ***installation requirements*** are identified to meet client requirements. 1.3 Relevant ***Occupational Health and Safety*** (***OHS***), ***legislative*** and ***organisational requirements*** are identified and interpreted to ensure compliance. 1.4 ***Appropriate information*** is interpreted to identify correct ***resources*** for estimate and quote. 1.5 Ability to provide appropriate security system is assessed in accordance with client requirements.
2 Estimate costs.	2.1 ***Organisational rate schedules*** are identified and used to establish pricing information. 2.2 Quotations for resources are obtained to ensure fair comparison between suppliers. 2.3 Resource availability and delivery dates are confirmed with supplier in accordance with organisational procedures. 2.4 Site inspection is conducted to identify ***installation requirements*** and contingencies for ***possible problems*** considered.
3 Finalise quotation.	3.1 ***Quotation*** is prepared providing an accurate and concise

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ELEMENT	PERFORMANCE CRITERIA
	summary of security system supply and installation costs.
	3.2 Quotation is presented to client in accordance with agreed timeframes and organisational requirements for language, style and format.
	3.3 Required ***changes or variations*** are negotiated to meet client and organisational requirements
	3.4 Client file is created and ***documentation*** regularly updated and maintained in accordance with legislative requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- basic analysis of information to identify problems and contingencies
- complete workplace documentation and reports
- information technology
- literacy skills to understand and communicate security information (reading, writing, speaking, numeracy and listening)
- numeracy skills to compare prices and accurately calculate estimates and quotations to return a profit where possible
- personal skills to relate to people from a range of social, cultural and ethnic backgrounds and varying physical and mental abilities
- present a professional image
- problem solving and negotiation
- questioning to check understanding
- read and interpret plans, drawings and specifications.

Required knowledge

- difference between negative and positive language
- differences between written and spoken English
- duty of care requirements
- how to read and use body language to gain confidence of clients
- how to safeguard confidential information
- how to use business equipment to present information
- legislation, regulations and contractual obligations applicable to the provision of quotations and installation of security systems

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REQUIRED SKILLS AND KNOWLEDGE

- organisational policies and standards relating to the presentation of information for clients
- organisational standards and procedures for client service
- organisational standards for the presentation and maintenance of written information
- procedures and channels for reporting information
- rights and responsibilities of clients
- types and functions of security equipment and systems.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- complying with organisational policies and procedures and relevant legislation in the development of quotations for the provision of security systems
- conducting an assessment of client security needs to identify appropriate security system and installation requirements
- confirming client requirements and system options from information gathered and discussing potential problems and contingencies
- preparing and documenting accurate and detailed estimates and quotations for the provision and installation of security systems within agreed timeframes
- using appropriate communication skills to liaise and negotiate system requirements and prices with clients and suppliers.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to a registered provider of assessment services
- access to a suitable venue and equipment

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- access to plain English version of relevant statutes and procedures
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency should be assessed using questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Assessment may involve:

- discussions with client
- questioning of police, insurance companies, government agencies and other relevant bodies
- review of client floor plans and supporting documentation
- visual inspections of client premises or building.

***Security system* may**

- computerised

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be:	• electronic • mechanical • procedural • specialised (eg biometric).
***Installation requirements* may relate to**:	• cherry picker • commercial and residential alarm systems • drill • electronic equipment (eg screen equipment, video cameras and monitors) • ladder • scaffolding • specialist tools or equipment • sub-contract labour.
***Organisational requirements* may relate to**:	• access and equity policies, principles and practices • business and performance plans • client service standards • code of conduct, code of ethics • communication and reporting procedures • complaint and dispute resolution procedures • emergency and evacuation procedures • employer and employee rights and responsibilities • OHS policies, procedures and programs • own role, responsibility and authority • personal and professional development • privacy and confidentiality of information • quality assurance and continuous improvement processes and standards • resource parameters and procedures • roles, functions and responsibilities of security personnel • storage and disposal of information.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:	• controlling and minimising risks
	• correct manual handling including shifting, lifting and carrying
	• first aid
	• identifying and reporting hazards and risks
	• knowledge of emergency and evacuation procedures
	• transporting and storing dangerous goods
	• using and maintaining equipment:
	  • business equipment and technology
	  • communications equipment and technology
	  • personal protection equipment
	  • security equipment and technology

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	• using and storing hazardous materials and substances.

***Legislative requirements* may relate to**:	• applicable commonwealth, state and territory legislation which affects work such as:
	  • workplace safety
	  • environmental issues
	  • equal employment opportunity
	  • industrial relations
	  • anti-discrimination and diversity
	• Australian building codes and regulations
	• Australian Communications Authority cabling standards
	• Australian standards and quality assurance requirements
	• award and enterprise agreements
	• evidence collection
	• freedom of information
	• licensing arrangements and certification requirements
	• privacy requirements
	• relevant industry codes of practice
	• telecommunications
	• trade practices.

***Appropriate information* may be**:	• drawings • plans and schematics • texts.
***Resources* may be**:	• equipment • labour • materials.
***Organisational rate schedules* may relate to**:	• industry based labour rates • insurance • organisational labour rates • standard equipment costs • standard installation costs • standard materials costs • standard monitoring costs • standard service costs • standard unit costs.
***Installation requirements* may relate to**:	• cherry picker • commercial and residential alarm systems • drill • electronic equipment (eg screen equipment, video cameras and monitors) • ladder • scaffolding

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- specialist tools or equipment
- sub-contract labour.

***Possible problems* may relate to**:

- availability, delivery
- cash flow
- crowds
- equipment or system faults
- insurance, time penalties, disputes
- limited access to assistance and resources
- own skills and knowledge
- problems with security or communication equipment
- restricted site access, building progress
- risks and hazards
- vehicles
- weather and environment conditions.

***Quotations* are written and may include**:

- client brief
- company identification information
- contractual arrangements
- cost breakdown
- equipment or system locations and positions
- equipment or system type
- parameters of system capabilities
- recommended and agreed security system
- results of security assessment
- service and maintenance needs
- suitable sign-off arrangements
- system capabilities
- system specifications and configuration
- terms of trade
- timelines for provision and installation
- warranty, guarantee, liability and terms and conditions.

***Changes or variations* may relate to**:

- changes in cost
- delays
- exclusions
- installation
- monitoring
- revised or additional services
- revised or new equipment or system needs
- service and product warranty, guarantee, liability and terms and conditions
- service commencement or completion dates
- terms of trade.

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***Documentation* may include**:	• client details • documented quotation • records of client and supplier communication including actions taken • security equipment or system options and costs • supplier information.

Unit Sector(s)

Unit sector Security

Competency field

Competency field Technical security

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CPPSEC3049A Modify and repair security equipment and system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to conduct minor modifications and repairs on a range of security equipment and systems. It requires the ability to diagnose and rectify common basic faults and refer more complex faults for specialist attention. This work applies to extra-low voltage environments.

This unit may form part of the licensing requirements for persons responsible for maintaining security equipment and systems in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in those work roles involving the maintenance of security equipment and systems. Competency requires legal and operational knowledge applicable to relevant sectors of the security industry. The knowledge and skills described in this unit are to be applied within relevant legislative and organisational guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for maintenance.	1.1 Applicable provisions of ***legislative*** and ***organisational requirements*** relevant to ***assignment instructions*** are identified and complied with.
	1.2 Assignment instructions are obtained, reviewed and confirmed as required with ***relevant persons***.
	1.3 ***Maintenance*** requirements of ***security equipment and system*** are confirmed.
	1.4 Security equipment and system to be ***modified*** or ***repaired*** is identified and confirmed.
	1.5 ***Tools***, ***equipment and materials*** needed to carry out the work are selected and checked for correct operation and safety.
	1.6 Potential and existing ***risks and hazards*** in the work area are identified and controlled in accordance with ***Occupational Health and Safety*** (***OHS***) requirements and own role, competence and authority.
2 Carry out maintenance.	2.1 ***Personal protection equipment*** is selected and used in accordance with OHS requirements.
	2.2 Security equipment and system identified for maintenance is ***accessed*** with minimal ***disruption*** to services and others in the work area.
	2.3 Security equipment and system is inspected and assessed for operational effectiveness against normal operating criteria.

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ELEMENT	PERFORMANCE CRITERIA
	2.4 Common faults in security equipment and system are diagnosed and appropriate repairs or modifications are carried out in accordance with manufacturer's instructions.
	2.5 Complex faults and repair requirements are identified and reported for specialist attention.
	2.6 Routine servicing of security equipment and system is carried out in accordance with manufacturer's instructions.
	2.7 Safe workplace practices are applied throughout maintenance and repair procedures in accordance with OHS requirements.
3 Complete and document maintenance activities.	3.1 Security equipment and system components are reassembled and tested for correct operation in accordance with approved procedures.
	3.2 Work area is restored and tools and equipment are cleaned, maintained and stored in accordance with organisational procedures.
	3.3 Waste from service and repair activities is collected, treated and disposed of or recycled in accordance with organisational procedures.
	3.4 Malfunctions, faults, wear or damage to tools or equipment is documented and reported for repair or replacement in accordance with organisational procedures.
	3.5 Notification of work completion is made to relevant persons in accordance with organisational procedures.
	3.6 Relevant ***documentation*** is completed and securely maintained in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- apply safe and environmentally aware work practices
- carry out maintenance, modifications and repairs on a range of security equipment and systems
- commission security equipment and systems
- communicate in a clear and concise manner
- complete documentation

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REQUIRED SKILLS AND KNOWLEDGE

- conduct basic carpentry and fitting, soldering, welding, and drilling
- estimate and organise materials, tools and equipment requirements
- identify and comply with applicable legislative requirements including licensing
- identify and control workplace hazards
- identify and diagnose faults and malfunctions
- identify and follow routine workplace safety procedures
- maintain an inventory of equipment and consumables associated with maintenance activities
- measure and calculate volumes, consumption and servicing requirements
- read and interpret a multimeter
- read and interpret plans and specifications
- recognise routine and complex faults and malfunctions of a range of security equipment and systems
- solve routine problems
- test and confirm operational effectiveness of security equipment and systems
- use suitable tools and equipment, including hand and power tools
- work in confined spaces.

Required knowledge

- applicable legislative requirements including licensing and client confidentiality
- cable identification, termination and connection procedures
- earthing systems arrangements and requirements
- electrical concepts
- emergency procedures
- fault-finding techniques
- maintenance procedures relevant to security equipment and systems
- procedures for accessing and storing tools, equipment and materials
- procedures for reporting malfunctioning or faulty tools and equipment
- reporting and documentation requirements
- requirements for commissioning of security equipment and systems
- requirements for compliance with Australian building codes and regulations and Australian Communications Authority cabling standards
- requirements for working in a confined space
- risks and hazards associated with maintenance procedures
- safe workplace procedures
- security equipment and system configurations and methods of programming
- security equipment and system repair techniques
- technical terminology
- types of faults associated with security equipment and systems
- types, functions and features of security equipment and systems
- waste disposal procedures

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REQUIRED SKILLS AND KNOWLEDGE

- welding, grinding and oxy-acetylene cutting principles and procedures.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- interpreting and complying with all applicable legislative and licensing requirements for repair work
- accessing security equipment and system with minimal disruption to others in the work area and normal services
- applying appropriate methods and using suitable tools and equipment to carry out maintenance, repairs and modifications on a range of security equipment and systems
- cleaning and storing tools and equipment and reinstating work site to a clean and safe condition
- organising own work tasks within specified repair timeframes and completing documentation related to modification or repair
- inspecting and testing security equipment and system for correct operation and accurately identifying faults and malfunctions
- safely following maintenance and repair procedures and carrying out checks to ensure integrity and security of security equipment and system.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to plain English version of relevant statutes and procedures
- access to a registered provider of assessment services
- access to a suitable venue and equipment
- assessment instruments including personal planner and

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assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency could be assessed using the following methods of assessment:

- observation of processes and procedures
- questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations

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- anti-discrimination and diversity
- Australian Communications Authority cabling standards
- Australian building codes and regulations
- Australian standards and quality assurance requirements
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- telecommunications
- trade practices.

Organisational requirements may relate to:

- access and equity policies, principles and practices
- business and performance plans
- client service standards
- code of conduct, code of ethics
- communication and reporting procedures
- complaint and dispute resolution procedures
- emergency and evacuation procedures
- employer and employee rights and responsibilities
- OHS policies, procedures and programs
- own role, responsibility and authority
- personal and professional development
- privacy and confidentiality of information
- quality assurance and continuous improvement processes and standards
- resource parameters and procedures
- roles, functions and responsibilities of security personnel
- storage and disposal of information.

Maintenance may include:

- cleaning
- minor modifications and adjustments
- routine repairs
- servicing.

***Assignment instructions* may include**:

- access to site and specific site requirements
- equipment, tools and material requirements
- personal protection clothing and equipment requirements
- reporting requirements
- security equipment and system information:
  - features, functions and capabilities
  - manufacturer's instructions
  - service and maintenance requirements

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- warranties and guarantees
- security equipment and system location information
- specific client requirements
- timeframes
- work schedules
- work tasks and procedures.

***Relevant persons* may include**:
- clients
- colleagues
- engineers and technicians
- equipment and systems manufacturers
- security consultants
- security personnel
- site managers or project managers
- supervisor.

***Maintenance* may include**:
- minor modifications
- repairs
- servicing.

Security equipment and systems may include:
- access control systems
- audible and visual warning devices
- cameras and monitors
- commercial and residential alarm systems
- detection devices
- electric and mechanical fire safety and fire locking systems
- electronic locks and locking systems
- electronic readers
- electronic screen equipment
- intercoms and control panels
- security doors and door controls
- specialised access control systems eg biometrics.

***Modifications* may relate to**:
- change in system capabilities and functions
- locations, placement and positions
- monitoring requirements.

***Repairs* may be made**:
- on-site
- remotely.

***Tools*, *equipment and materials* may include**:
- cable testing equipment
- communications equipment
- computer and software
- fixing tools
- hand tools
- ladder

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- materials:
  - cable
  - fixings
  - grease
  - patch materials
  - screws
  - sealants
  - wiring
  - solder
- multimeter
- personal protection equipment
- power tools.

***Risks and hazards* may relate to**:

- chemical hazards eg battery corrosion
- exposed electrical wiring
- exposure to:
  - asbestos
  - building debris
  - dust
  - glass fibre
  - live power
  - natural and other gas build-up
  - noise
  - vermin
  - water
- manual handling
- non-compliance with building codes and regulations.

***Occupational Health and Safety* (*OHS*) *requirements* may relate to**:

- emergency procedures
- following confined spaces procedures
- implementation of safety policies and procedures:
  - chemicals, gas and vapour
  - isolation procedures
  - monitoring and testing procedures
  - use of personal protection equipment and clothing
  - work clearance procedures
- risk and hazard recognition
- safety training
- working with electrical wiring and cables
- working with tools and equipment.

***Personal protection equipment* may**

- breathing apparatus
- fire extinguisher

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include:	• first aid kit • gloves • head protection • hearing protection • knee pads • masks • safety boots • safety glasses. • warning signs and tapes • witches hats.
***Access* may relate to**:	• disablement of system • modem access • phone line access • removal of housing • use of access code • use of access token • use of keys.
***Disruptions* may affect**:	• access • business operations • noise • security • time • use of equipment.
***Documentation* may include**:	• faulty or malfunctioning tools and equipment • materials used, parts and components replaced • operational checks conducted • recommended repairs or disposal of equipment • repairs, adjustments or servicing undertaken • security equipment and system faults and diagnosis • testing and inspection results • written and electronic reports.

Unit Sector(s)

Unit sector	Security

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Competency field

Competency field Technical security

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MEM03001 Perform manual production assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03001B Perform manual production assembly

Application

This unit of competency defines the skills and knowledge required by production workers to assemble components and/or sub-assemblies in a production environment, and applies to assembly operations that are manual in nature and do not require complex adjustments.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

Where the selection and use of power tools is required unit MEM18002 Use power tools/hand held operations should also be selected.

This unit should not be selected when unit MEM18055 Dismantle, replace and assemble engineering components has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

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Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select assembly equipment and components**	2.1	Select assembly equipment according to instructions or job sheets
		2.2	Obtain components/sub-assemblies and arrange for assembly process
		2.3	Use equipment and tools in a safe manner
3	**Perform assembly and tests**	3.1	Assemble components in the correct sequence to meet specifications
		3.2	Test and check assembly for compliance to job sheet requirements, taking appropriate action for non-compliance

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
4	**Store and protect assembly**	4.1 Handle and store components and/or assemblies safely and in a manner least likely to cause damage
		4.2 Record information on assembly data production schedules, job sheets, checklists and other standard forms and templates

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components/sub-assemblies include:	• parts that make up the sub-assembly and components
Recorded/input includes one or more of the following:	• production schedules • job sheets • checklists
Tested/check includes:	• testing/checking according to specification of assembled product

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03001B Perform manual production assembly

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03001 Perform manual production assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03001B Perform manual production assembly

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate tools, components, sub-assemblies and equipment for required assembly tasks
- using appropriate handling procedures to minimise damage to components and/or assemblies
- assembling components in a production environment
- testing and/or checking assemblies against specifications
- recognising and taking appropriate remedial action for any out-of-specification assembly
- storing components and assemblies following SOPs
- completing production records as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- correct application, use and storage of assembly tools and equipment
- sequence in which the assemblies are to be performed
- storage location of component/sub-assemblies
- required tests and/or checks for assembly compliance with specifications and required action for non-conformance
- component assembly documentation procedures
- potential damage that can occur to components and assemblies through the use of inappropriate handling and/or unsafe storage procedures.

Assessment Conditions

- Assessors must:

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  - have vocational competency in this unit at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM03002 Perform precision assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03002B Perform precision assembly

Application

This unit of competency defines the skills and knowledge required to assemble and test complex engineering components and mechanical assemblies in a production manufacturing environment.

Assembly activities typically involve build-to-order work and/or low volume and/or complex assemblies and/or long assembly timeframes.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Plan precision assembly**	2.1	Check all components/sub-assemblies against job sheet, assembly list or equivalent instructions
		2.2	Carry out fitting requirements and sequential assembly planning where applicable
		2.3	Select tools, equipment and components/sub-assemblies to meet job requirements
3	**Assemble engineering components**	3.1	Identify any defective or faulty components/sub-assemblies and take action according to SOPs
		3.2	Prepare functional components/sub-assemblies for assembly
		3.3	Apply assembly techniques and principles appropriate to the job requirements
		3.4	Fit components of assembly to ensure correct positioning and conformance with specifications
		3.5	Test assembly to ensure that components interface/interact according to operational specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Adjust mechanical assemblies**	4.1 Perform final adjustments on assembly to ensure it meets operational specifications using predetermined standards of quality and safety
	4.2 Identify any faulty assemblies for rework by operator or, where the fault is outside the scope of the workstation, take appropriate action for fault correction by others
	4.3 Mark the completed assembly following SOPs
5 **Protect assembly from damage and complete documentation**	5.1 Handle and store components and/or assemblies according to procedures and in a manner least likely to cause damage
	5.2 Record information on assembly data production schedules, job sheets, checklists and other standard forms and templates

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components/ sub-assemblies include:	• parts that make up the sub-assembly and components
Records/inputs includes one (1) or more of the	• production schedules • job sheets

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:	• checklists • standard forms and templates
Adjustments include one (1) or more of the following:	• clearances • mesh • tension • level • alignment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03002B Perform precision assembly

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03002 Perform precision assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03002B Perform precision assembly

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing a sequential assembly plan of components and sub-assemblies, including the selection of appropriate tools to meet job requirements
- using appropriate handling procedures to minimise damage to components and/or assemblies
- fitting, assembling and testing engineering components or mechanical assemblies to operational specifications
- identifying any faulty components or assembly and taking action according to SOPs
- storing components and assemblies following SOPs
- completing production records as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- precision assembly techniques and fitting requirements
- characteristics, use and storage requirements of relevant tools and equipment used in precision assembly of components
- sources of the component/sub-assemblies
- correct sequence in which precision assembly is performed
- procedures for testing and checking assembled components
- identification of non-conformance in precision assemblies and procedures for correction
- relevant assembly production record keeping requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in precision assembly at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM03003 Perform sheet and plate assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03003B Perform sheet and plate assembly

Application

This unit of competency defines the skills and knowledge required to assemble prefabricated/formed components using a range of joining techniques in a production assembly environment.

Where soft soldering is required unit MEM05003 Perform soft soldering should also be selected.

Where brazing and/or silver soldering is required unit MEM05006 Perform brazing and/or silver soldering should also be selected.

Where production welding skills are required unit MEM05013 Perform manual production welding should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements
2	**Select and use sheet and plate assembly equipment**	2.1	Select assembly equipment to suit application in accordance with job requirements
		2.2	Use equipment in a safe manner according to SOPs
3	**Assemble fabrications**	3.1	Assemble products and verify against job requirements
		3.2	Produce assembly following correct sequence of operations
		3.3	Join assemblies/fabrications to job requirements using specified joining techniques
		3.4	Test/check assembly for compliance with job requirements using SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Protect assembly from damage**	4.1 Handle and store assemblies/fabrications according to SOPs and in a manner least likely to cause damage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Job requirements can be identified from one (1) or more of the following:	• specifications • sketches • job sheets • work instructions • verbal instructions
Assembly equipment includes one (1) or more of the following:	• jigs • fixtures • other appropriate tools
Application includes one (1) or more of the following:	• manufacture of white goods • appliances • electrical cabinets • metal furniture • cladding and shelving • box trailer bodies • ductwork • other sheet and plate assemblies

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Joining techniques include one (1) or more of the following:	• seaming • bonding • riveting

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03003B Perform sheet and plate assembly

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03003 Perform sheet and plate assembly

Modification History

Release 1. Supersedes and is equivalent to MEM03003B Perform sheet and plate assembly

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting job requirements from verbal or written job instructions for sheet and plate assembly
- selecting appropriate tools, components and equipment for required assembly tasks
- using appropriate handling procedures to minimise damage to components and/or assemblies
- using equipment safely to assemble and join products to job requirements using specified assembly and joining techniques
- checking assembly to ensure compliance
- handling and storing components, fabrications and assemblies.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- purpose of a sequence of operations
- application and function of assembly equipment, including jigs, fixtures and other appropriate tools
- safety precautions and operating characteristics of assembly equipment and tools
- application and limitations of different joining techniques
- surface preparation and joining techniques
- assembly tests/checks
- safe handling and storage procedures applicable to components, fabrications and/or assemblies
- potential damage that can occur to components, fabrications and assemblies through the use of inappropriate handling and/or unsafe storage procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in perform sheet and plate assembly at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM03004 Perform electronic/electrical assembly (production)

Modification History

Release 1. Supersedes and is equivalent to MEM03004B Perform electronic/electrical assembly (production)

Application

This unit of competency defines the skills and knowledge required to identify and assemble electronic/electrical components and to test the assembled components for conformance to job sheets/specifications. It includes the use of automatic wave soldering machines.

Where the selection and use soldering skills is required unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components and unit MEM05002 Perform high reliability soldering and desoldering, should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of measurement skills is required unit MEM12002 Perform electrical/electronic measurement should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

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Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select assembly equipment**	2.1	Select assembly equipment and use in accordance with instructions or job sheets to SOPs
		2.2	Use equipment in a safe manner according to SOPs
3	**Identify electronic/electrical components**	3.1	Identify common name, appearance, and colour of electronic and electrical components
		3.2	Identify polarity indicators on components
4	**Assemble components**	4.1	Select correct components by code/colour or other identification methods
		4.2	Prepare components/devices for soldering or other

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	termination methods
	4.3 Connect cables to a variety of plug and socket combinations, as required
	4.4 Handle and store components safely using appropriate anti-static handling procedures and techniques in accordance with procedures
	4.5 Produce assembly following correct sequence of operations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03004B Perform electronic/electrical assembly (production)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03004 Perform electronic/electrical assembly (production)

Modification History

Release 1. Supersedes and is equivalent to MEM03004B Perform electronic/electrical assembly (production)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate tools, components/devices and cables and equipment for required assembly tasks
- identifying and selecting correct electronic/electrical components
- preparing components/devices for soldering and other termination methods using appropriate techniques according to SOPs
- connecting cables to a variety of plug and socket combinations
- using appropriate anti-static handling procedures and techniques to handle and store components safely
- following correct sequence of operations to produce assembling, including testing and checking to ensure compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Correct application of assembly tools and equipment and hazards associated with misuse
- polarity indicators on common electronic and electrical components and the consequences of connecting them incorrectly
- preparation and termination methods for components/devices including soldering and non-soldering techniques
- connection requirements of a variety of plugs and sockets
- anti-static procedures and techniques and the safe handling and storage requirements of electrical and electronic components
- potential damage that can occur by not following the correct sequence of operations
- specifications against which the assembly is to be checked/tested using appropriate procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing electronic/electrical assembly (production) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM03005 Rework and repair (electrical/electronic production)

Modification History

Release 1. Supersedes and is equivalent to MEM03005B Rework and repair (electrical/electronic production)

Application

This unit of competency defines the skills and knowledge required to test electrical/electronic assemblies against functional requirements, identify faults, and repair or rework the assemblies to rectify the faults and applies to work undertaken on a range of components and printed circuit boards.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools for hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM03004	Perform electronic/electrical assembly (production)
MEM05001	Perform manual soldering/desoldering - electrical/electronic components

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Perform tests**	2.1	Test assembly for functional requirements from job sheets
		2.2	Identify faults in assembly or soldering
3	**Identify cause of fault and rectify fault**	3.1	Identify cause of fault using procedures
		3.2	Complete repair and/or rework according to instructions from job cards, sketches and assembly specifications
		3.3	Handle and store components safely using appropriate anti-static handling procedures and techniques

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03005B Rework and repair (electrical/electronic production)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03005 Rework and repair (electrical/electronic production)

Modification History

Release 1. Supersedes and is equivalent to MEM03005B Rework and repair (electrical/electronic production)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- following SOPs to test assembly for functional requirements and identify faults to be rectified
- rectifying faults and completing repair and/or rework according to appropriate instructions from job cards, sketches and assembly specifications
- using appropriate anti-static handling procedures and techniques to handle and store components safely.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- functional requirements of the assembly
- assembly tests and methods
- common causes of faults in connections and components and their symptoms
- dangers of static electricity to electrical and electronic components
- anti-static procedures and techniques and the safe handling and storage requirements of electrical and electronic components.

Assessment Conditions

- Assessors must:
  - have vocational competency in reworking and repairing (electrical/electronic production) at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM03006 Set assembly stations

Modification History

Release 1. Supersedes and is equivalent to MEM03006B Set assembly stations

Application

This unit of competency defines the skills and knowledge required to set up, adjust and test assembly stations according to defined procedures, it also includes routine maintenance of the equipment.

Where the assembly station involves manual production assembly unit MEM03001 Perform manual production assembly should also be selected.

Where the assembly station involves the assembly of sheet and plate unit MEM03003 Perform sheet and plate assembly should also be selected.

Where the assembly station involves the assembly of electrical and/or electronic components in a production environment unit MEM03004 Perform electronic/electrical assembly (production) should also be selected.

Where the selection and use of machine setting skills is required unit MEM07003 Perform routine machine setting and unit MEM07004 Perform complex machine setting, should also be selected as appropriate.

Where the setting of automated assembly processes is required unit MEM07040 Set multistage integrated processes should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of powered tools for hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

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No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Assembly

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select and use a range of hand tools and equipment**	2.1	Use hand tools and equipment for setting assembly stations in a safe manner, according to instructions and procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

3	**Set assembly stations**	3.1	Set up assembly stations for a range of processes and operations according to defined procedures
		3.2	Observe and implement safe work practices
		3.3	Adjust assembly stations to specifications and operational requirements
		3.4	Test assembly stations for correct operation
4	**Maintain equipment**	4.1	Carry out routine maintenance according to SOPs
		4.2	Identify and change worn or damaged components

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Set up includes one (1) or more of the following:	• jigs • fixtures • die sets • store and tooling
Processes and operations include (1) one or more	• riveting • pressing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

of the following:

- screwing
- tensioning
- gluing
- identification
- numbering or hot stamping of components and assembles

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM03006B Set assembly stations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM03006 Set assembly stations

Modification History

Release 1. Supersedes and is equivalent to MEM03006B Set assembly stations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- using hand tools and equipment for setting assembly stations in a safe and effective manner according to instructions and SOPs
- setting up and adjusting assembly stations for a range of processes and operations according to defined procedures and specifications whilst observing safe work practices
- testing assembly stations to ensure correct operation in accordance with specifications
- carrying out routine maintenance and identifying and changing worn or damaged components.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures to be followed in setting up assembly stations to meet production order or schedule
- specifications applicable to the assembly station
- effect of various adjustments that can be made to the assembly station
- routine maintenance requirements
- effect of worn or damaged components on the operational requirements and specifications of the assembly station.

Assessment Conditions

- Assessors must:
  - have vocational competency in setting assembly stations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04001 Operate melting furnaces

Modification History

Release 1. Supersedes and is equivalent to MEM04001B Operate melting furnaces

Application

This unit of competency defines the skills and knowledge required to operate melting furnaces.

It applies to the operation and operational maintenance of furnaces primarily used for continuous or staged bulk melting/smelting of a range of metals, holding of hot liquids, or the melting of metals for production processes, such as casting, moulding and galvanising.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select materials**	2.1	Complete requisitions as required according to SOPs
		2.2	Undertake charge analysis and convert the charge analysis to furnace charge weight and weigh charge in accordance with SOPs
		2.3	Enter routine and familiar information onto proformas and standard workplace forms
3	**Start up furnace**	3.1	Inspect furnace for any defects or damage
		3.2	Identify faults and areas for routine repair of the furnace
		3.3	Undertake routine operational maintenance of furnace
		3.4	Start up furnace according to procedures
		3.5	Report all start-up faults in accordance with procedures
4	**Charge furnace**	4.1	Identify and follow emergency/safety procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.2	Pre-heat materials if required
	4.3	Charge materials into furnace
	4.4	Identify and keep available suitable areas for emergency unloading of molten metal
5 **Monitor furnace**	5.1	Maintain furnace at optimum operating condition
	5.2	Take sample for chemical analysis and apply remedial action as required
	5.3	Dross and/or degas furnace
	5.4	Check temperature of metal and adjust if necessary
6 **Tap or unload the furnace**	6.1	Identify the quantity of the required metal
	6.2	Carry out tap rate
	6.3	Undertake tapping or unloading safely according to procedures
7 **Shut down furnace**	7.1	Complete shutdown of furnace
	7.2	Undertake routine operational maintenance of furnace in accordance with procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Furnaces include one (1) or more of the following:	• singular or multi • coke • oil • gas fired • electric induction • arc • resistance
Operational maintenance includes one (1) or more of the following:	• routine lubrication • cleaning • routine repair/repointing of refractory

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04001B Operate melting furnaces

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04001 Operate melting furnaces

Modification History

Release 1. Supersedes and is equivalent to MEM04001B Operate melting furnaces

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and relevant test data sheets for furnace operation
- completing materials requisitions as required
- undertaking charge analysis and converting charge analysis to furnace charge weight and weighing the weight in accordance with procedures
- completing the start-up procedures for the applicable furnace, including completing routine operational maintenance and inspection for any:
  - defects
  - damage
  - faults
  - areas for routine repair
- starting up and charging applicable furnace whilst following emergency/safety procedures, including identifying suitable areas for emergency unloading of molten metal
- maintaining the furnace at optimum operating condition, including:
  - taking sample for chemical analysis and applying remedial action as required
  - drossing and/or degassing furnace
  - checking temperature of metal and adjusting if necessary
- undertaking tapping or unloading of furnace by identifying the quantity of required metal to SOPs
- completing shutdown and performing routine operational maintenance.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- refractory conditions, faults, and routine repair and maintenance
- condition of cooling water supply

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- starting procedures for different types of furnaces
- metallic charge materials and alloying elements
- weighing procedures and scale types
- correct order of loading of different charge materials
- thermocouple condition monitoring and adjustment mechanism for furnace
- interpretation of carbon equivalent and wedge test results
- degassing procedures, including tablet, lance and other procedures
- coagulant agents, application procedures and slag removal procedures
- shutdown procedures
- applicable industry standards, national/Australian Standards, Safe Work Australia guidelines, and state/territory regulatory codes of practice/standards.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating melting furnaces at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04002 Perform gravity die casting

Modification History

Release 1. Supersedes and is equivalent to MEM04002B Perform gravity die casting

Application

This unit of competency defines the skills and knowledge required to perform gravity die casting into permanent dies.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Casting and moulding

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) and apparatus in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare equipment**	2.1	Mix die coat in correct proportion in accordance with SOPs
		2.2	Lift and maintain die temperatures at the appropriate level
		2.3	Apply die coat in the correct sequence
		2.4	Locate and close die
		2.5	Place die on machine and attach and tighten toggle clamps to required torque
		2.6	Attach air cooling to the die as specified if required
3	**Carry out manual pouring**	3.1	Undertake pour in a manner which reduces porosity and lamination
		3.2	Identify conditions that contribute to inferior castings or rejects
		3.3	Allow adequate cooling time
		3.4	Pour at a continuous and appropriate rate during filling
		3.5	Monitor condition of die coating condition and re-spray as required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Remove materials**	4.1	Remove parts in a manner that minimises damage
		4.2	Remove any flash from the die surface
		4.3	Store parts in a manner that minimises damage
5	**Clean die**	5.1	Operate shot blaster according to procedures
		5.2	Take chemical analysis of melt and apply remedial action as required
		5.3	Dross and/or degas furnace
		5.4	Clean work area of coating and shot residue
		5.5	Complete reports/records in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Metals include one (1) or more of the following:	• aluminium • aluminium alloys • non-ferrous • ferrous
Appropriate safety clothing and apparatus includes one (1)	• Aluminium Association safety status sheet recommendations

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:

- glasses
- aluminised suits
- masks
- gloves
- gauntlet

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04002B Perform gravity die casting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04002 Perform gravity die casting

Modification History

Release 1. Supersedes and is equivalent to MEM04002B Perform gravity die casting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and other applicable reference documents for gravity die casting operation
- preparing equipment for gravity die casting, including:
  - mixing and applying die coat in correct proportion and sequence
  - lifting and maintaining die temperatures at the correct level
  - locating, placing securing die on machine and attaching air cooling if required
- carrying out manual pouring in a continuous and appropriate rate that reduces porosity and lamination, avoiding conditions that can contribute to inferior castings or rejects
- removing and storing components and removing any flash from the die surface
- cleaning die using a shot blaster in a safe manner
- taking chemical analysis of melt and applying remedial action as required
- drossing and/or degassing furnace to SOPs
- completing records as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE) and apparatus
- die coat function(s) in gravity die casting
- correct proportions and consistency of die coats as determined by manufacturers' specifications
- correct identification of die coat materials
- procedures for raising the temperature of the die to the correct level and maintaining the required temperature in accordance with SOPs
- procedures to be followed when pouring molten metal to produce sound castings
- causes of defects in castings

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- curing times for castings of various volumes and materials
- timing of die coat application and quantity of die coat to be used for different applications
- correct procedures for removing castings from the die and storing of castings
- die condition and need for shot blasting
- shot blaster operating procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing gravity die casting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04003 Operate pressure die casting machine

Modification History

Release 1. Supersedes and is equivalent to MEM04003B Operate pressure die casting machine

Application

This unit of competency defines the skills and knowledge required to start, operate and shut down pressure die casting machines.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Conduct pre-operational checks**	2.1	Conduct start-up procedure
		2.2	Adjust the shot size if required
		2.3	Check nitrogen and/or vacuum systems if applicable
		2.4	Undertake a functional check of the picking robot, and adjust the component gripper if required
		2.5	Adjust die spray nozzles
		2.6	Carry out planning to ensure efficient flow of finished product
3	**Operate machine to produce castings**	3.1	Apply appropriate knowledge of die casting process to the operation, adjustment and monitoring of machine functions
		3.2	Operate a die casting machine to SOPs, including maintenance of liquid metal and die operating conditions
		3.3	Break runners off in an appropriate manner
		3.4	Inspect castings visually for defects

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.5	Handle castings in a manner that minimises risk of damage to the casting and injury to personnel
	3.6	Produce first-off castings, inspect visually and submit for checking against job requirements
4 **Monitor furnace**	4.1	Maintain furnace at optimum operating condition
	4.2	Shut down furnace following SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Plan for efficient flow of finished product includes one (1) or more of the following:	• breaking off runners • stacking baskets • bins • conveyors
Defects include one (1) or more of the following:	• porosity • cracks • tears • splits • sinks • cold shuts • tinning and die surface crazing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04003B Operate pressure die casting machine

Links

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Assessment Requirements for MEM04003 Operate pressure die casting machine

Modification History

Release 1. Supersedes and is equivalent to MEM04003B Operate pressure die casting machine

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and other applicable reference documents for operating pressure die casting machine
- starting and operating pressure die casting machine, including conducting start-up procedures and all functions of the control panel
- operating machine to produce castings and carrying out visual inspection of first-off castings and submitting for checking against specifications
- maintaining furnace at optimum operating temperature
- completing shutdown procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for pre-start checks
- procedures for adjusting the shot size and the effect of incorrect shot size on the quality of the die casting
- procedures for starting up the die casting machine and adjustments to be made to ensure correct operation
- removing runners from the die casting
- common faults in die castings and their probable causes
- procedures for inspecting die castings for common faults and probable causes
- checking first-off castings for conformance to specification
- shutting down the machine
- function of nitrogen and vacuum systems in the die casting process and the procedures for checking and adjusting
- function of a picking robot and the component gripper and procedures for adjusting the picking robot and effects that this can cause

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- reasons for spraying the die and procedures for adjusting the die spray nozzles
- operations to be performed subsequent to die casting the product
- tools and equipment used in die casting
- methods of transporting and conveying the die cast product
- die casting process, including the effects of the adjustment of each machine control has on the quality of the die casting produced
- die casting machine operation, including operating parameters and maintenance of liquid levels
- damage that can be caused to castings through inappropriate handling and storage
- specifications of the die cast product.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating pressure die casting machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04004 Prepare and mix sand for metal moulding

Modification History

Release 1. Supersedes and is equivalent to MEM04004B Prepare and mix sand for metal moulding

Application

This unit of competency defines the skills and knowledge required to prepare and mix sand for metal moulding in continuous and batch type mills.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where calculations are required unit MEM12024 Perform computations should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Load mixer**	2.1	Perform all pre start-up checks according to procedures
		2.2	Determine formula for sand mix according to specifications
		2.3	Measure and load materials according to formula specification
3	**Mix sand**	3.1	Mix sand for correct time to specifications
		3.2	Monitor the performance of mixer and the condition of the sand
		3.3	Maintain material supply
		3.4	Report faults
4	**Take and test samples**	4.1	Extract sample in an appropriate manner
		4.2	Apply test in accordance with procedures
		4.3	Compare test results against specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		4.4	Adjust mix as required to meet specifications
5	**Discharge mixture**	5.1	Charge load according to SOPs
		5.2	Dispose of unwanted treated sand according to SOPs
6	**Clean mixer**	6.1	Shut down mixer to standard safety and operating procedures
		6.2	Clean mixer

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• sand • silica • zircon • chromite • mixtures and water
Faults include:	• chemical ratios – acid, binder and water

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04004B Prepare and mix sand for metal moulding

Links

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Assessment Requirements for MEM04004 Prepare and mix sand for metal moulding

Modification History

Release 1. Supersedes and is equivalent to MEM04004B Prepare and mix sand for metal moulding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and applicable reference documents in preparing and mixing sand for metal pouring
- loading moulding sand mixer, conducting pre-start checks, measuring and loading materials according to instructions
- mixing sand for correct time, monitoring performance of mixer and condition of sand, reporting any faults
- extracting sample and applying test and comparing against specifications, and adjusting mix if required
- charging load correcting and disposing of unwanted treated sand according to SOPs
- shutting down and cleaning mixer.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics, safe handling procedure and mixture applications of the sand and binding agent
- moulding requirements
- mixers, applications, loading, operating and unloading procedures
- volumes, quantities, ratios and percentages
- sampling, testing and acceptance criteria for mixed sand
- procedures for cleaning and shutting down mixer
- environmental requirements for the disposal of unwanted sand.

Assessment Conditions

- Assessors must:

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  - have vocational competency in preparing and mixing sand for metal moulding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04006 Operate sand moulding and core making machines

Modification History

Release 1. Supersedes and is equivalent to MEM04006B Operate sand moulding and core making machines

Application

This unit of competency defines the skills and knowledge required to operate sand moulding and core making machines in a foundry.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Casting and moulding

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Conduct pre-operational checks**	2.1	Select and inspect pattern/core box for conformance to specifications and clean as required
		2.2	Identify damaged patterns/core boxes for repair or replacement
		2.3	Set up pattern/core box in bolster and core box according to specifications
3	**Operate machine to produce mould/cores**	3.1	Select appropriate moulding media to produce mould and core to specification
		3.2	Fill moulds/cores to specification
		3.3	Operate machine
		3.4	Unload machine in a safe manner
		3.5	Strip, inspect and paint moulds/cores as required
4	**Assemble moulds/cores**	4.1	Dry, glue and vent moulds/cores as required to specification and close
		4.2	Set runner bush to specification as required
5	**Restore work**	5.1	Leave the work site in a safe state, including clearing all

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
area	materials/debris from the worksite
	5.2 Dispose of unwanted treated sand according to SOPs and legislative and statutory requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Machines include one (1) or more of the following:	• automatic mould and core making • semi-automatic mould and core making
Moulding media includes one (1) or more of the following:	• green sand • shell sand • chemically bonded media

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04006B Operate sand moulding and core making machines

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04006 Operate sand moulding and core making machines

Modification History

Release 1. Supersedes and is equivalent to MEM04006B Operate sand moulding and core making machines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and other applicable reference documents to operate sand moulding and core making machines
- selecting and inspecting pattern/core box for damage against specifications
- setting up pattern/core box in bolster and core box
- operating relevant machine to produce moulds/cores, including selecting appropriate moulding media
- filling moulds/cores to specifications
- unloading machine according to SOPs
- stripping, inspecting and painting moulds/cores as required
- assembling moulds/cores as required by specifications
- disposing of unwanted treated sand according to SOPs
- shutting down and cleaning machine
- completing all proformas and standard workplace forms as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics and applications of sand and binding agents
- sand moulding and core making machine operation, fault identification, analysis and rectification procedures
- core selection and loading procedures.

Assessment Conditions

- Assessors must:

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  - have vocational competency in operating sand moulding and core making machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04007 Pour molten metal

Modification History

Release 1. Supersedes and is equivalent to MEM04007B Pour molten metal

Application

This unit of competency defines the skills and knowledge required to manually pour molten metal as part of metal casting and moulding processes.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

Where lifting and moving of ladles requires the use of overhead cranes, applicable units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Casting and moulding

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare for pouring molten metal**	2.1	Select equipment as required
		2.2	Check the condition of the mould and ladle according to procedures
		2.3	Check the temperature of molten metal for conformance to specification
		2.4	Sequence pouring method to procedures
		2.5	Identify the capacity of the required pour against specification
		2.6	Preheat and prepare the ladle to receive molten metal
3	**Transfer ladle to furnace**	3.1	Check safety clips in accordance with safety procedures
		3.2	Fill and transfer the ladle to the pouring area
		3.3	Determine additives from specification and add to molten metal as required
4	**Maintain quality of metal as required**	4.1	Remove slag and/or dross where necessary
		4.2	Monitor the temperature as required
		4.3	Undertake chemical analysis and apply remedial action

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	as required

5	**Pour molten metal**	5.1	Inform personnel in the immediate area of the metal pour that pour is to take place
		5.2	Pour metal safely to specification
		5.3	Pour metal at an appropriate and continuous rate
		5.4	Pour a test bar as required
6	**Empty excess metal from ladle and return ladle**	6.1	Pour and tag pigs
		6.2	Empty, clean and maintain the ladle according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Ladle includes one (1) or more of the following:	• lip pour • tea pot • bottom pour • barrel • bull ladles of varying capacity
Additives include one (1)	• alloys

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:

- inoculants
- spheroidisers
- coagulants

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04007B Pour molten metal

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04007 Pour molten metal

Modification History

Release 1. Supersedes and is equivalent to MEM04007B Pour molten metal

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, SOPs and standard test data sheets
- preparing manual pour of molten metal, including selecting equipment as required, and checking condition of mould and appropriate ladle
- checking temperature of molten metal for conformance against specification, sequencing pouring method and identifying the capacity of the required pour
- transferring ladle to furnace after preheating/preparing to receive molten metal
- filling and transferring the ladle to the pouring area in a safe and effective manner and adding additives as required to molten metal
- maintaining quality of metal by removing slag/dross, monitoring temperature and undertaking chemical analysis and applying any remedial action
- pouring molten metal safely at an appropriate and continuous rate after informing personnel in immediate area that a pour is to take place to required specifications, pouring a test bar as required
- emptying excess metal and cleaning and maintaining ladle.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types and pouring characteristics of metals
- types and characteristics of ladles
- procedures for maintaining condition and integrity of ladle
- procedures for safe handling and transference of molten metal
- metal treatments, applications and procedures for making additions to molten metal
- slag and dross removing procedures
- techniques for sampling and testing molten metal
- pouring procedures
- metal identification and tagging procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in pouring molten metal at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04008 Fettle and trim metal castings/forgings

Modification History

Release 1. Supersedes and is equivalent to MEM04008B Fettle and trim metal castings/forgings

Application

This unit of competency defines the skills and knowledge required to fettle, trim and assess quality of metal castings/forgings in production and jobbing environments.

Where the interpretation of technical drawings is required Unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required Unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings/sketches, job sheets or work instructions
		1.5	Locate and arrange correct mouldings and/or castings/forgings for efficient processing
2	**Observe safety requirements**	2.1	Handle castings/forgings using manual or mechanical handling methods appropriate to the task
		2.2	Store and position castings/forgings in a safe manner
3	**Identify excess material for removal**	3.1	Remove casting from mould and/or sand media from casting as required
		3.2	Check visually castings/forgings as suitable for further processing, and identify excess metal according to procedures
4	**Select correct tools and equipment**	4.1	Select cleaning method appropriate to casting and job requirements
		4.2	Set and use rumbling/shot blast/sand blast equipment to specification and in accordance with SOPs, as required
		4.3	Select and use appropriate hand tools for the given task
		4.4	Select and use appropriate power tools and accessories for the given task

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
5	**Remove excess material**	5.1	Remove excess metal (e.g. runners, risers and flashing) using methods and equipment appropriate to the task
		5.2	Identify excess metal suitable for recycling according to SOPs
		5.3	Identify and isolate excess metallic materials according to SOPs
6	**Quality assess castings/forgings**	6.1	Check visually castings/forgings for conformance with specifications
		6.2	Reject or set aside and identify for further consideration or remedial action non-conforming castings/forgings
		6.3	Report/record faults according to SOPs, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hand tools include one (1) or more of the following:	• files • chisels • hammers • other dedicated tools for fettling and trimming
Power tools include one	• saws

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

(1) or more of the following:	• croppers • grinding disks/belts (including grades) • swing grinders • pedestal grinders

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04008B Fettle and trim metal castings/forgings

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04008 Fettle and trim metal castings/forgings

Modification History

Release 1. Supersedes and is equivalent to MEM04008B Fettle and trim metal castings/forgings

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings/sketches and other applicable reference documents to fettle and trim metal castings/forgings
- handling castings/forgings using manual or mechanical handling methods and storing and positioning them in a safe manner
- identifying excess metal for removal by carrying out visual inspection in accordance with procedures
- selecting and using appropriate cleaning method, including the use of rumbling/shot blast/sand blast equipment
- selecting and using appropriate hand and power tools to remove excess metal e.g. runners, risers and flashing in a safe and effective manner
- identifying excess metal suitable for recycling and metallic materials that need to be isolated
- carrying out inspection to verify against specifications and rejecting or setting aside those requiring remedial action and reporting/recording faults.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- accept/reject/rework criteria
- fettling requirements
- fettling tools
- fettling standards
- handling and storage requirements
- excess metals suitable for recycling.

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Assessment Conditions

- Assessors must:
  - have vocational competency in fettling and trimming metal castings and forgings at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04010 Develop and manufacture wood patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04010 Develop and manufacture wood patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04010B Develop and manufacture wood patterns.

Application

This unit of competency defines the skills and knowledge required to develop and manufacture all types of solid, split and turned wood patterns and wood pattern component parts, including general engineering and master patterns.

Patterns are constructed by laminating timber and timber composites, stave and lag, box or frame construction or any alternative method that minimises timber shrinkage, warp and achieves required. Solid patterns are set up on a regular or irregular joint. Turned patterns are manufactured using tools and machines appropriate for shaping wood.

Where patterns are required to be set up on pattern plates then unit MEM04012 Assemble plated patterns should also be selected.

Where the development and manufacture of marine propellers, conveyor screws and cast gears is required unit MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns should also be selected.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

This unit should not be selected when unit MEM18014 Manufacture press tools and gauges has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 20

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Pre-requisite Unit

MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Develop and lay out wood patterns**	2.1 Determine type of wood pattern required through application of moulding/casting techniques and foundry processes
		2.2 Select appropriate timber/timber composites to meet specification
		2.3 Calculate pattern parameters to specification e.g. angles, tapers, clearances and contractions
		2.4 Lay out pattern showing tapers, machining allowances, core prints and method of construction to specification
		2.5 Develop and manufacture jigs and fixtures to aid wood pattern manufacture as required
3	**Manufacture wood patterns**	3.1 Mark out materials and develop construction to meet specification
		3.2 Produce pattern or pattern component parts to size and shape using acceptable wood patternmaking techniques, tools, equipment and procedures
		3.3 Check pattern or pattern component parts for conformance to specifications
		3.4 Join and fix pattern component parts to meet specifications
		3.5 Mark, colour code or tag pattern to specifications or SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Master patterns include one (1) or more of the following:	• multiple contraction • skeleton • frame and strickle • wheels • pulleys • chain sheaves • impellors
Moulding/casting techniques includes:	• a variety of sand moulding techniques and sand mediums
Timber/timber composites include one (1) or more of the following:	• hardwood • softwood • laminates • plywood • veneers • bonded fibreboard
Joining and fixing includes one (1) or more of the following:	• glued • screwed • nailed • stapled

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04010 Develop and manufacture wood patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04010B Develop and manufacture wood patterns.

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Links

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Assessment Requirements for MEM04010 Develop and manufacture wood patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04010 Develop and manufacture wood patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04010B Develop and manufacture wood patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, technical sketches and customer requirements to develop wood patterns
- determining type of wood pattern required through application of moulding/casting techniques and selecting the appropriate timber/timber composites to meet requirements
- preparing patterns for manufacture using the appropriate mathematical calculations for angles, tapers, clearances and determination of contraction rates
- laying out pattern showing tapers, machining allowances, core prints and method of construction
- manufacturing jigs and fixtures as required
- marking out and manufacturing all types of solid, split and turned wood patterns and wood pattern component parts using appropriate hand and power tools
- joining and fixing pattern components as required and checking conformance to specification
- marking, colour coding or tagging pattern to specifications for future use.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- timber products, including features, characteristics and applications
- moulding and casting techniques
- tooling required for casting/moulding
- methoding techniques
- use and application of jigs and fixtures

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- methods of constructing wood patterns
- formulae and mathematical techniques required for necessary manufacturing of patterns/core boxes, i.e. contraction, taper, clearances and machining allowances
- identification coding and numbering
- pattern checking techniques
- mouldability i.e. surface finish, face taper, convex or concave perspectives and undercuts.

Assessment Conditions

- Assessors must:
  - have vocational competency in the development and manufacture of wood patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04011 Produce polymer patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04011 Produce polymer patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04011B Produce polymer patterns.

Application

This unit of competency defines the skills and knowledge required to design, manufacture and finish polymer patterns.

It applies to the manufacture of investment casting dies and polymer patterns for medium production castings, core boxes, tooling aids and jigs and checking of fixtures.

Construction includes solid polymer, filled, laminated fibreglass or metal inserts.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13003	Work safely with industrial chemicals and materials
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and prepare patterns and cores**	2.1	Inspect patterns or cores for appropriate surface finish and set up on jointline or flat board to specification
		2.2	Select appropriate parting agent and apply to polymer specifications
3	**Manufacture moulds, patterns and tooling aids**	3.1	Select appropriate polymer materials to specification
		3.2	Mix polymer and hardener to correct ratios and specifications using standard safety and operating procedures
		3.3	Apply polymer to specification and use predetermined methods, ensuring that air is not entrapped in application,

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	excessive heat is not generated and delamination does not occur in final use
	3.4 Strip, inspect, clean and repair pattern/core box as required
	3.5 Machine and finish faces of polymer pattern to specifications
	3.6 Apply appropriate method of location to patterns and core boxes
	3.7 Check polymer tooling for conformance to specifications as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Surface finish includes one (1) or more of the following:	• texture • gel coat • aluminium fill
Parting agent includes one (1) or more of the following:	• wax • PVA
Polymer materials include one (1) or more of the following:	• epoxy resins • urethane

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Method of location includes one (1) or more of the following:	• male and female joint • pin and bush

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04011 Produce polymer patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04011B Produce polymer patterns.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04011 Produce polymer patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04011 Produce polymer patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04011B Produce polymer patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, technical sketches and customer requirements in producing polymer patterns
- preparing to produce polymer patterns by inspecting patterns and cores for appropriate surface finish, and setting up jointline or flat board to specifications
- undertaking numerical operations, geometry and calculations/formulae, including determination of contraction rates
- selecting and mixing the appropriate polymer materials and hardener to correct ratios and proportions in a safe and effective manner
- applying polymer to specification ensuring air is not trapped, excessive heat is not generated and delamination does not occur in final use
- machining and finishing faces of polymer pattern to specifications
- applying method of location to patterns and core boxes
- carrying out maintenance and repairing of pattern/core box as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- machining for patternmaking
- parting agents
- methods of locating patterns and core boxes
- range of surface finishes
- range of polymers and their applications
- mixing ratios and calculations
- characteristics of polymer under exothermic reaction and associated control measures

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- methods of stripping
- pattern checking techniques.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing polymer patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04012 Assemble plated patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04012 Assemble plated patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04012B Assemble plated patterns.

Application

This unit of competency defines the skills and knowledge required to assemble all types of plated patterns using a range of materials. It covers the manufacture (when appropriate) and mounting of runner systems.

Where the manufacture of polymer-plated patterns is required unit MEM04011 Produce polymer patterns should also be selected.

Where the selection and use of cast aluminium plates is required unit MEM04014 Develop and manufacture production patterns should also be selected.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where the selection and use of machining competencies is required applicable units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM04010	Develop and manufacture wood patterns
MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and layout patterns**	2.1	Inspect pattern to ensure dimensions and surface finish conforms to specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.2	Lay out pattern and runner system to specifications from drawings, sketches or verbal instructions
		2.3	Align pattern in an appropriate manner
3	**Mount pattern on plates**	3.1	Attach cope and drag patterns/double sided match plate patterns to pattern plate/s according to specification
		3.2	Inspect cope and drag patterns/double sided match plate patterns for security and alignment
4	**Mount runner system**	4.1	Adjust volume of runner system to conform to specifications
		4.2	Attach runner components pattern plates to specification using appropriate fixing and joining techniques
5	**Inspect plated pattern assembly**	5.1	Inspect surface and mouldability of plated pattern assembly for compliance with specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1)
- timber

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:
- timber composite
- metal

Aligned includes one (1) or more of the following:
- measurement
- dowels

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04012 Assemble plated patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04012B Assemble plated patterns.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04012 Assemble plated patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04012 Assemble plated patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04012B Assemble plated patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, sketches and other applicable reference documents to assemble plated patterns
- undertaking relevant engineering calculations, including the determination of contraction rates
- inspecting patterns for conformance, laying out pattern and runner system and aligning pattern to specifications
- securely attaching cope and drag patterns/double sided match plate patterns to pattern plates, inspecting for alignment according to specifications
- attaching runner components pattern plates using appropriate fixing and joining techniques and adjusting volume of runner system to conform to specifications
- inspecting plated pattern assembly including surface and mouldability for compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- units of measurement, numerical operations and calculations associated with assembling plated patterns
- fixing and drilling techniques
- reason for using particular layout and runner system
- all types of plated patterns using a range of materials
- techniques for avoiding cross jointing or mismatch of the pattern and their relationship to the pin-centre
- methoding systems

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- mouldability i.e. surface finish, face taper, convex or concave perspectives and undercuts
- moulding and casting techniques.

Assessment Conditions

- Assessors must:
  - have vocational competency in assembling plated patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04013 Develop and manufacture polystyrene patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04013 Develop and manufacture polystyrene patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04013B Develop and manufacture polystyrene patterns.

Application

This unit of competency defines the skills and knowledge required to develop and manufacture all types of patterns using polystyrene, including patterns for the lost foam process and for those areas on a wood pattern and core box where polystyrene is required.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM04010	Develop and manufacture wood patterns
MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Select the appropriate grade and type of polystyrene to meet specifications
2	**Mark out pattern**	2.1	Determine contraction allowance by performing calculations
		2.2	Mark out pattern/pattern components to specifications
3	**Manufacture pattern**	3.1	Join and secure pattern components in an appropriate manner using adhesives appropriate to the task
		3.2	Select appropriate tools and techniques to manufacture

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			polystyrene patterns to specification
		3.3	Check pattern for conformance to specifications and mark for identification
4	**Protect pattern from damage**	4.1	Handle and store patterns in a safe manner least likely to cause damage using appropriate procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Grade/type includes:	• size and density of bead
Adhesives include one (1) or more of the following:	• PVA • hot glue
Tools include one (1) or more of the following:	• hot wire • knives • saws

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04013 Develop and manufacture polystyrene patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04013B Develop and manufacture polystyrene patterns.

Links

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Assessment Requirements for MEM04013 Develop and manufacture polystyrene patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04013 Develop and manufacture polystyrene patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04013B Develop and manufacture polystyrene patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, sketches and drawings for developing and manufacturing polystyrene patterns, including determining the grade and type of bead
- marking out pattern/pattern components to specifications, including determining the contraction allowance
- manufacturing pattern by joining and securing pattern components using appropriate adhesives
- selecting and using appropriate tooling
- checking and marking pattern for identification purposes to specification
- handling and storing patterns in an appropriate manner.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types and applications of polystyrene for pattern making
- formulae and mathematical techniques required for manufacturing patterns/core boxes, i.e. contraction, taper, clearances and machining allowances
- marking out techniques for polystyrene patterns, including undercuts and holes
- types and applications of adhesives
- tools and their uses in the manufacture of polystyrene patterns
- pattern checking techniques
- handling and storage techniques.

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Assessment Conditions

- Assessors must:
  - have vocational competency in the development and manufacture of polystyrene patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory, as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04014 Develop and manufacture production patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04014 Develop and manufacture production patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04014B Develop and manufacture production patterns.

Application

This unit of competency defines the skills and knowledge required to manufacture all types of metal patterns, master patterns, core boxes and associated equipment, including cast plates made directly or from a master pattern.

Patterns may be integral with the plate or mounted to the plates with gating and depending upon specifications, production core boxes also may be loose or mounted into core box rigs.

Where the manufacture of polymer production patterns is required unit MEM04011 Produce polymer patterns should also be selected.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM04010	Develop and manufacture wood patterns
MEM04012	Assemble plated patterns
MEM04018	Perform general woodworking machine operations
MEM07005	Perform general machining

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MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to**	2.1	Develop and plan pattern and design with reference to customer's specification (written or verbal) for number,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	undertake work		layout, runner system and core box design
		2.2	Interpret and visualise pattern design from drawings, prints or plans and check against customer requirements
		2.3	Develop a plan for sequence of manufacture for either a high or low volume foundry production pattern
3	**Develop pattern equipment**	3.1	Select and obtain appropriate materials to meet requirements of strength, durability and component finish
		3.2	Perform calculations appropriate to establishing pattern parameters
4	**Manufacture production patterns and core boxes**	4.1	Select appropriate machines and machining process to shape and produce production patterns and core boxes to specification
		4.2	Select and use a range of hand and hand held power tools to fashion and manufacture production patterns and core boxes to specification
		4.3	Check production patterns and core boxes to specification and surface finish and check for mouldability

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• ferrous • non-ferrous • alloy
Calculations include one (1) or more of the following:	• angles • tapers • contraction rates
Machines include one (1) or more of the following:	• lathes • milling machines • grinders • pedestal drills • pantographs • other appropriate machines

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04014 Develop and manufacture production patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04014B Develop and manufacture production patterns.

Links

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Assessment Requirements for MEM04014 Develop and manufacture production patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04014 Develop and manufacture production patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04014B Develop and manufacture production patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning pattern and designing by reading and interpreting customer's specifications (verbal or written) for number, layout, runner system and core box design
- interpreting and visualising pattern design and checking against customer requirements
- developing a plan for sequence of manufacture for a low or high volume
- developing pattern equipment by selecting and obtaining appropriate materials
- undertaking mathematical calculations for angles, tapers, clearances and determination of contraction rates
- selecting and using appropriate machines, machining process and hand and power tools as needed to shape, produce, fashion and manufacture production patterns and core boxes to specification
- checking production patterns and core boxes for surface finish, mouldability to specification.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of metals and alloys and their application in the development and manufacture of production patterns
- tolerances and contraction rates typically used in the manufacture of production patterns
- production moulding and casting techniques
- tooling required for casting and moulding
- methoding techniques
- use and application of jigs and fixtures

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- methods of construction, including machining provision and clamping arrangements
- appropriate techniques, tools and equipment to measure, mark out and produce production patterns
- formulae and mathematical techniques required for manufacturing production patterns and core boxes, i.e. contraction, taper, clearances and machining allowances
- identification coding and numbering
- pattern checking techniques
- mouldability, i.e. surface finish, face taper, convex or concave perspectives and undercuts.

Assessment Conditions

- Assessors must:
  - have vocational competency in the development and manufacture of production patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04015 Develop and manufacture vacuum forming moulds and associated equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04015 Develop and manufacture vacuum forming moulds and associated equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM04015B Develop and manufacture vacuum forming moulds and associated equipment.

Application

This unit of competency defines the skills and knowledge required to develop and manufacture all types of vacuum forming moulds and associated equipment.

Where the assembly of plated patterns is required unit MEM04012 Assemble plated patterns should also be selected.

Where the manufacture of production patterns is required unit MEM04014 Develop and manufacture production patterns should also be selected.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM04010	Develop and manufacture wood patterns
MEM04011	Produce polymer patterns
MEM04018	Perform general woodworking machine operations
MEM07005	Perform general machining

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MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Develop and mark out pattern for vacuum forming**	2.1	Apply vacuum forming processes to determine the design of vacuum forming moulds and construct associated equipment
		2.2	Select appropriate material to meet specifications
		2.3	Calculate pattern parameters, taking into account plastic sheet thickness and shrinkage
		2.4	Mark out vacuum forming pattern, showing size and position of air evacuation and of the moulded form
3	**Manufacture pattern for vacuum forming**	3.1	Select and use appropriate machines and machining process to shape and produce vacuum forming pattern to specification
		3.2	Select and use a range of hand and hand held power tools to fashion and manufacture vacuum forming patterns to specification
		3.3	Check constructed vacuum forming pattern to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Vacuum forming processes include one (1) or more of the	• positive pressure • negative pressure

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Material includes one (1) or more of the following:	• timber • epoxy resins • composites • polymer • metal

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04015 Develop and manufacture vacuum forming moulds and associated equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM04015B Develop and manufacture vacuum forming moulds and associated equipment.

Links

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Assessment Requirements for MEM04015 Develop and manufacture vacuum forming moulds and associated equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04015 Develop and manufacture vacuum forming moulds and associated equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM04015B Develop and manufacture vacuum forming moulds and associated equipment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to develop and manufacture vacuum forming moulds
- applying vacuum forming processes in determining design of moulds and selecting appropriate materials to meet specifications
- undertaking calculations for pattern parameters taking into account plastic sheet thickness and contraction rates
- developing and marking out pattern showing size, position of air evacuation and of the moulded form
- selecting and using appropriate machines, machining process and hand and power tools as needed to shape, produce, fashion and manufacture vacuum forming patterns to specification
- checking vacuum forming pattern to specification.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- timber and epoxy resin product knowledge, including features, characteristics and applications
- vacuum forming techniques
- tooling required for manufacture of vacuum forming patterns and moulds
- formulae and calculations/formulae required to manufacture patterns and moulds i.e. contraction, taper

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- techniques, tools and equipment to measure, mark out and produce vacuum forming patterns and moulds
- pattern checking techniques.

Assessment Conditions

Assessors must:

  - have vocational competency in the development and manufacture of vacuum forming moulds and associated equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04016 Develop and manufacture precision models

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04016 Develop and manufacture precision models (Release 1).

Release 1. Supersedes and is equivalent to MEM04016C Develop and manufacture precision models.

Application

This unit of competency defines the skills and knowledge required to develop and manufacture precision models where accurate and complicated models are required to assist in the development and manufacture of production of tooling for a wide variety of processes.

This unit can also apply to the inspection/completion of items made in the stereo lithography process.

When the programming of coordinate measurement machines and/or NC/CNC machines is required appropriate machine programming units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM04010	Develop and manufacture wood patterns
MEM04011	Produce polymer patterns
MEM04012	Assemble plated patterns
MEM04013	Develop and manufacture polystyrene patterns
MEM04014	Develop and manufacture production patterns
MEM04015	Develop and manufacture vacuum forming moulds and associated equipment

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MEM04018	Perform general woodworking machine operations
MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Lay out model**	2.1	Select appropriate material to meet specifications
		2.2	Develop and plan finished model design with reference to customer's specifications (written or verbal) for finish, quality and form, using applicable processes
		2.3	Calculate contractions allowances, clearances and tapers to establish model parameters
		2.4	Design and manufacture datum boards, jigs and fixtures as required
3	**Manufacture model**	3.1	Determine sequence of manufacture, including build-up on datum board, and establishing datum's mark out of model and areas to be NC/CNC machined
		3.2	Select and use appropriate machines and machining processes to shape/produce model to specifications
		3.3	Select and use a range of hand and hand held power tools to fashion and manufacture model to fine tolerances according to specifications, ensuring that surface finish is appropriate to the type of model
		3.4	Undertake appropriate measurement/calculations to check specifications, including coordinate measuring and machine checking as required
		3.5	Record and report all deviations or modifications to original tooling design, prints or plans, consistent with procedures

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Models include one (1) or more of the following:	• flow • viewing • prototype • development
Material includes one (1) or more of the following:	• timber • metal • plastic • fibreglass • composites
Processes include one (1) or more of the following:	• high volume foundry tooling • blow moulding • metal forming • vacuum forming • rotational moulding • gravity die casting • pressure die casting • low pressure die casting • complex ferrous and non-ferrous castings • plastic injection moulding
Specifications include one (1) or more of the following:	• complex drawings • Mylar drawings • technical sketches • customer requirements

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04016 Develop and manufacture precision models (Release 1).

Release 1. Supersedes and is equivalent to MEM04016C Develop and manufacture precision models.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04016 Develop and manufacture precision models

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04016 Develop and manufacture precision models (Release 1).

Release 1. Supersedes and is equivalent to MEM04016C Develop and manufacture precision models.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning finished model design by reading, interpreting customer's specifications (verbal or written) for finish, quality and form, and selecting appropriate material
- undertaking calculations for contraction allowances, clearances and tapers to establish model parameters
- designing and manufacturing datum boards, jigs and fixtures as required
- determining sequence of manufacture, including build-up on datum board, marking out and areas to be NC/CNC machined
- selecting and using appropriate machines and machining process
- selecting and using hand and power tools as needed to shape, produce, fashion and manufacture model to fine tolerances according to specification ensuring that surface finish is appropriate to the type of model
- checking specifications by using appropriate measuring techniques, including coordinate measuring and machine checking
- recording all deviations or modifications to original tool design, prints or plans according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- consequences of selecting inappropriate materials
- various processes requiring models
- calculus, engineering calculations and formulae relating to developing and manufacturing precision models
- properties and uses of datum boards, datum holes or datum faces

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- reasons for developing the sequence of manufacture
- range of machines and machining processes and their operations
- various checking procedures and devices, such as coordinate measuring and machine checking
- procedures for recording deviation or modification to original drawings or specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in the development and manufacture of precision models at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04017B Develop and manufacture gear, conveyor screw and propeller patterns.

Application

This unit of competency defines the skills and knowledge required to manufacture patterns for all types of cast gears, conveyor screws and marine propellers using a full range of materials.

Gear patterns may be segmented or any other method used to minimise timber shrinkage or warpage to achieve the required strength.

Conveyor and marine screws may be built up using predetermined thicknessed timber, either over a mandrel or a layout. Patterns may be set up on a joint board or plated for ease of moulding.

Where the assembly of plated patterns is required unit MEM04012 Assemble plated patterns should also be selected.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM04010 Develop and manufacture wood patterns

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MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Lay out pattern**	2.1	Select appropriate material to specifications
		2.2	Apply moulding, cast techniques and foundry processes in determining the type of pattern required
		2.3	Calculate pattern parameters
		2.4	Lay out pattern showing tapers, machining allowances, core prints and method of construction to specification
		2.5	Develop and manufacture jigs and fixtures to aid the manufacture of the pattern form as required
3	**Manufacture pattern**	3.1	Mark out material and develop construction to meet specifications
		3.2	Produce pattern or pattern component parts to size and shape using appropriate hand and hand held power tools, techniques and procedures
		3.3	Check pattern or pattern component parts for compliance to specifications
		3.4	Join and fix pattern component parts according to specifications
		3.5	Mark, colour-code and/or tag pattern in compliance with specifications or procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material includes one (1) or more of the following:

- hardwood
- softwood
- epoxy resins
- composites

Pattern parameters include one (1) or more of the following:

- pitch circles
- pressure angles
- tooth form
- left and right hand flight helix
- pitch axial dimensions
- angles
- tapers
- clearances
- contraction allowances

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04017B Develop and manufacture gear, conveyor screw and propeller patterns.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04017 Develop and manufacture gear, conveyor screw and propeller patterns (Release 1).

Release 1. Supersedes and is equivalent to MEM04017B Develop and manufacture gear, conveyor screw and propeller patterns.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning the appropriate pattern by identifying and interpreting specifications, sketches, drawings and other applicable reference documents in determining type of pattern required
- selecting appropriate materials, applying moulding, casting techniques and foundry processes to the type of pattern required
- undertaking calculations of pattern parameters appropriate to developing various types of gear, conveyor and propeller forms
- laying out pattern according to specification showing tapers, machining allowances, core prints and method construction
- designing and manufacturing jigs and fixtures as required
- manufacturing pattern by marking out material for construction, producing pattern or pattern components to size and shape utilising appropriate hand and power tools
- joining and fixing pattern component parts as required and checking final product for compliance with specifications
- marking, colour coding and/or tagging pattern according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- timber, epoxy resin and composite product knowledge, including features, characteristics and applications
- moulding and casting techniques for cast gears, conveyor screws and marine propellers
- tooling required for casting/moulding

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- methoding techniques
- use and application of jigs and fixtures
- methods of construction
- techniques, tools and equipment to measure, mark out and produce gear, conveyor screw and propeller patterns
- mathematical calculations and formulae required to manufacture patterns/core boxes - contraction, taper, pitch, profiles, clearances and machining allowances
- identification coding and numbering
- pattern checking techniques
- mouldability, i.e. surface finish, face taper, convex or concave perspectives and undercuts.

Assessment Conditions

- Assessors must:
  - have vocational competency in the development and manufacture of gear, conveyor screw and propeller patterns at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04018 Perform general woodworking machine operations

Modification History

Release 1. Supersedes and is equivalent to MEM04018B Perform general woodworking machine operations

Application

This unit of competency defines the skills and knowledge required to set up and operate woodworking machines used by engineering patternmakers and marine fabricators.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools for hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Note: This unit does not cover the use of woodworking machines for furniture and building construction.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Set up woodworking machines**	2.1	Select appropriate woodworking machine to meet specifications
		2.2	Select tools and cutters appropriate to task requirements
		2.3	Sharpen and/or shape cutting tools as required
		2.4	Install tools and cutters in an appropriate manner according to procedures
		2.5	Set and adjust guards and stops
3	**Operate woodworking machines**	3.1	Position and secure material to be machined
		3.2	Machine materials to specification
		3.3	Optimise material use and minimise waste
4	**Check finished component**	4.1	Check machined component against specifications and predetermined finish

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Job requirements include one (1) or more of the following:

- sizing
- appearance in terms of figure, grain or surface finish
- allowance of imperfections, including:
  - twist
  - bow
  - bend
  - sloping grain
  - knots
  - shakes
  - gum veins

Woodworking machines include one (1) or more of the following:

- band saws
- buzzers
- thicknesses
- disk sander
- bobbin sander
- pattern mill
- wood lathe
- pedestal router and drill

Set up includes the following:

- installation of the blades and cutters
- settings for the job including adjustments for sizing and speed

Cutting tools include one (1) or more of the following:

- blades
- outer bits

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Guards/stops include:

- fixed and variable guards and stops

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04018B Perform general woodworking machine operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04018 Perform general woodworking machine operations

Modification History

Release 1. Supersedes and is equivalent to MEM04018B Perform general woodworking machine operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, sketches and other applicable reference documents to determine job requirements
- selecting and setting up appropriate woodworking machine by selecting and installing appropriate tools/cutters, and adjusting fixed and variable guards and stops as required
- operating machine by positioning and securing material effectively, machining material to specifications and optimising material use and minimising waste
- checking machined component for predetermined finish against specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- application and use of general woodworking machines
- interpreting instructions, drawings or sketches
- numerical operations and calculations associated with this unit
- machine settings, including installation of blades and cutters, clamping for the job, and adjusting for size and speed
- range of tools and cutters for different purposes
- consequences of incorrect set or cutting angles
- consequences of tool holders, tools and cutters, being incorrectly secured
- consequences of not using guards
- timber product knowledge, including features, characteristics and applications
- methods of optimising quality of appearance, retention of shape, strength, and the minimisation of waste.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing general woodworking machine operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04019 Perform refractory installation and repair

Modification History

Release 1. Supersedes and is equivalent to MEM04019B Perform refractory installation and repair

Application

This unit of competency defines the skills and knowledge required to repair and install/replace all types of refractory, including relining furnaces, treatment vessels, ladles and launders.

It applies to the installation of the heat insulating material used inside molten metal vessels and includes material which can be machine rammed, hand rammed, forked or vibrated and includes refractory bricks and fibreboard.

Where routine repair/repointing of refractory during operational maintenance is required unit MEM04001 Operate melting furnaces and MEM04007 Pour molten metal, should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Inspect and knock out refractory**	2.1	Identify specific areas of the refractory for repair or replacement
		2.2	Determine sequence of operations to remove refractory to meet the job specification
		2.3	Select appropriate tools and equipment to safely remove damaged refractory
		2.4	Remove and dispose of damaged refractory according to requirements
3	**Prepare refractory materials**	3.1	Select appropriate refractory materials to meet specifications
		3.2	Mix refractory media to requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

4	**Install refractory**	4.1	Determine installation of refractory sequence of operations
		4.2	Install refractory using appropriate tools, equipment and techniques
5	**Cure refractory**	5.1	Cure refractory to specifications using appropriate equipment, techniques and procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Installed includes one (1) or more of the following:

- hand ramming
- machine ramming
- forked
- internal and external vibration

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04019B Perform refractory installation and repair

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04019 Perform refractory installation and repair

Modification History

Release 1. Supersedes and is equivalent to MEM04019B Perform refractory installation and repair

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- inspecting refractory by reading, interpreting and following specifications to identify specific areas for repair or replacement
- knocking out refractory by determining sequence of operations
- selecting appropriate tools and equipment to safely remove damaged material
- removing and disposing damaged material in accordance with regulatory and legislative requirements
- preparing and installing heat insulated materials used inside molten metal vessels using appropriate tools and equipment
- curing refractory to specifications using appropriate techniques, equipment and standard operating procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- repair or replacement requirements
- inspection techniques
- mixing, installing and curing techniques and equipment
- work health and safety (WHS) legislation and Environmental Protection Authority (EPA) regulations applying to working with refractory materials,

Assessment Conditions

- Assessors must:
  - have vocational competency in performing refractory installation and repair at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04020 Supervise individual ferrous melting and casting operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04020 Supervise individual ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04020A Supervise individual ferrous melting and casting operation.

Application

The unit of competency defines the skills and knowledge required by a foundry tradesperson to supervise ferrous melting and casting operations in a foundry to ensure specifications are met and safety procedures maintained. This work is performed under the overall direction of a metallurgist.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM04001	Operate melting furnaces
MEM04004	Prepare and mix sand for metal moulding
MEM04007	Pour molten metal
MEM04024	Produce moulds and cores by hand
MEM04025	Produce moulds and cores by hand (advanced)
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify specifications for required casting**	2.1	Identify required material specification and mould requirements
		2.2	Identify any special melting and casting requirements for the job
		2.3	Identify safety procedures for the required melting and casting operation
		2.4	Identify and follow regulations and codes of practice relevant to foundry and individual melting, pouring and casting operation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Verify metal charges to melting**	3.1	Select required components to give the required metal specification
		3.2	Calculate required charge of each component
		3.3	Recommend changes and/or additions to the charge
		3.4	Monitor the preparation of the charge, including checking for contaminants
4	**Monitor furnace operation**	4.1	Check that the furnace is in good operational condition and that appropriate lining is present
		4.2	Organise for maintenance and repairs as required
		4.3	Identify metal or alloy specification for required casting
		4.4	Monitor a melt to ensure the product meets specification
5	**Monitor pouring of molten metal**	5.1	Check pouring area is secure and that all non-essential personnel are excluded
		5.2	Check all members of the pouring crew are wearing appropriate PPE
		5.3	Ensure escape routes are known in advance by all members of the pouring crew
		5.4	Check emergency pour out pit is operational and other safety measures are in place
		5.5	Ensure moulds are ready to receive liquid metal, ensure access ways and pouring ways are clear, and that there are appropriate spaces between each mould
		5.6	Check pouring is undertaken at correct temperature and in efficient order
		5.7	Ensure pouring basin and moulds are ready to receive liquid metal
		5.8	Take required samples for analysis

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
6 **Control hazards**	6.1 Identify hazards in the metal melting/pouring process
	6.2 Assess the risks arising from those hazards
	6.3 Implement procedures to control those hazards in line with procedures and duty of care

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Moulds include one (1) or more of the following:	• sand • die • investment
Contaminants include one (1) or more of the following:	• non-specified metal • rubber • grease • water • paint and non-metallics • closed containers or pipes • pressure containers, including aerosols
Material specification includes one (1) or more of the following:	• ferrous metals • ferrous alloys • contaminants

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04020 Supervise individual ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04020A Supervise individual ferrous melting and casting operation.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04020 Supervise individual ferrous melting and casting operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04020 Supervise individual ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04020A Supervise individual ferrous melting and casting operation.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, safety procedures and codes of practice/standards for the required melting and casting operation
- checking for contaminates when verifying metal changes to melting and recommending changes and/or additions to the charge as required
- providing evidence from castings that were made using different alloys and moulds
- monitoring melting and casting operations of ferrous metal
- operating a melting furnace safely and monitoring and supervising the operation of a furnace by other employees
- handling pouring equipment and monitoring safely and supervising the operation of pouring equipment by other employees.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- charge calculations – importance of composition control, methods used to calculate for additions and types of alloy additions and their effects on casting behaviour and finished product
- steel – induction furnace melting, principles, refractories suitable for steelmaking and their characteristics, arc furnace melting; acid, basic, single slag, double slag, deoxidisation and hydrogen control and ladle refining
- cast iron – types of cast iron, influence of carbon and silicon contents, carbon equivalent, effect of cooling rate, microstructure and classification of graphite, carbide stabilisers and graphite, inoculation and types of inoculant, spheroidal graphite formation and treatment methods and casting characteristics of grey, S.G (ductile) and malleable cast irons

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- ferrous alloys – definitions of ferrous metals, grades of iron and their applications, including S.G. iron, ductile iron, grey and white irons, alloy cast irons, chilled and malleable iron, grades of steel and their applications, including carbon steel and alloys steels, methods of controlling physical properties, advantages/disadvantages of density of each type of ferrous metal, methods of controlling tensile strength of ferrous metals, methods of controlling the hardness of ferrous metals, the influence of melting points on production processes, shrinkage percentage of the types of ferrous metals, how to control metal fluidity, use of degassing to control gas defects, be able to take action to control grain size, casting temperature, make a selection of ferrous metal based on required properties, conduct metal analysis on ferrous metal and use Australian Standards (or other appropriate standard) for ferrous metals
- types of furnaces and their relative advantages and disadvantages – blast furnace, cupola, induction, direct arc, indirect arc, open hearth, reverberatory, rotary and maintenance
- refractory types and purposes, including dolomite, silica brick, chrome brick, ganister, fireclay, firebrick, magnesite, kyanite and fused alumina
- linings types and purposes, including monolithic, castable, rammable, bricks, basic, acid and neutral
- types of ladles – lip, tea pot and bottom pour
- safe working with ladles – pre-heat ladles, ladle maintenance and checking mechanical condition of ladles including gearboxes and safety locks
- use of lifting and handling equipment including – tongs, shanks, cranes, hoists, bogey ladles and maintenance
- supervision of other staff in melting and casting safety, including housekeeping, PPE, dry area and tools, pre-heating of ladles and safe working load of overhead cranes
- furnace operation procedures, including ensuring a dry and safe charge, warm and dry equipment, pre-heating, scrap selection, housekeeping, melting schedule, pouring schedule, calculations, including volume and mass calculations, charge calculations, maintaining supply and maintenance of melting and pouring equipment
- types of control equipment – thermal analysis, pyrometers, gas analysis, chemical analysis, wet chemical analysis, spectrograph and fluidity test
- quality control and procedures for:
  - accurate weighing, correct chemical analysis, covers and fluxes, mould/metal reactions, conduct and interpretation of thermal analysis, alloying procedure, thermal analysis, degassing, deoxidising, ladle refining, chill/wedge test and customer requirements
- types of defects and prevention, including but not limited to contamination, gas absorption, metal analysis, temperature control, oxidation and other defects common to iron and steel
- tapping and pouring operations, including when to pour according to job and furnace specification, availability of emergency pour out pits and other safety equipment, availability of cranes or other transport, pour out rate, ensure mechanical test bar is available and taken if required and ensure pig pouring and tagging is performed correctly.

Assessment Conditions

- Assessors must:

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  - have vocational competency in the supervision of individual ferrous melting and casting operation at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04021 Supervise individual non-ferrous melting and casting operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04021 Supervise individual non-ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04021A Supervise individual non-ferrous melting and casting operation.

Application

The unit of competency defines the skills and knowledge required by a foundry tradesperson to supervise non-ferrous melting and casting operations in a foundry to ensure specifications are met and safety procedures maintained. This work is performed under the overall direction of a metallurgist.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM04001	Operate melting furnaces
MEM04004	Prepare and mix sand for metal moulding
MEM04007	Pour molten metal
MEM04024	Produce moulds and cores by hand
MEM04025	Produce moulds and cores by hand (advanced)
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify specifications for required casting**	2.1	Identify required material specifications and mould requirements
		2.2	Identify any special melting and casting requirements for the job
		2.3	Identify safety procedures for the required melting and casting operation
		2.4	Identify and follow regulations and codes of practice relevant to foundry and individual melting, pouring and casting operation

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3	**Verify metal charges to melting**	3.1	Select required components to give the required metal specification
		3.2	Calculate required charge of each component
		3.3	Select required components to give the required metal specification
		3.4	Recommend changes and/or additions to the charge
		3.5	Monitor the preparation of the charge, including checking for contaminants
4	**Monitor furnace operation**	4.1	Check that the furnace is in good operational condition and that appropriate lining is present
		4.2	Organise for maintenance and repairs as required
		4.3	Identify metal or alloy specification for required casting
		4.4	Monitor a melt to ensure the product meets specification
5	**Monitor pouring of molten metal**	5.1	Check pouring area is secure and that all non-essential personnel are excluded
		5.2	Check all members of pouring crew are wearing appropriate PPE
		5.3	Ensure escape routes are known in advance by all members of the pouring crew
		5.4	Check emergency pour out pit is operational and other safety measures are in place
		5.5	Ensure moulds are ready to receive liquid metal, ensure access ways and pouring ways are clear, and that there are appropriate spaces between each mould
		5.6	Check pouring is undertaken at correct temperature and in efficient order
		5.7	Ensure pouring basin and moulds are ready to receive liquid metal
		5.8	Take required samples for analysis

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6	**Control hazards**	6.1	Identify hazards in the metal melting and pouring process
		6.2	Assess the risks arising from those hazards
		6.3	Implement procedures to control those hazards in line with procedures and duty of care

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Moulds include one (1) or more of the following:	• sand • die • investment
Contaminants include one (1) or more of the following:	• non-specified metal • rubber • grease • water • paint and non-metallics • closed containers or pipes • pressure containers, including aerosols
Material specification includes one (1) or more of the following:	• non-ferrous metals • non-ferrous alloys • contaminants
Furnaces include one (1) or	• crucible

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more of the following:

- oil
- gas
- induction
- channel
- coreless
- resistance
- reverberatory

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04021 Supervise individual non-ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04021A Supervise individual non-ferrous melting and casting operation.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04021 Supervise individual non-ferrous melting and casting operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04021 Supervise individual non-ferrous melting and casting operation (Release 1).

Release 1. Supersedes and is equivalent to MEM04021A Supervise individual non-ferrous melting and casting operation.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, safety procedures and codes of practice/standards for the required melting and casting operation
- checking for contaminates when verifying metal changes to melting and recommending changes and/or additions to the charge as required
- providing evidence from castings that were made using different alloys and moulds
- monitor melting and casting operations of non-ferrous metal
- operating a melting furnace safely and monitoring and supervising the operation of a furnace by other employees
- handling pouring equipment and monitoring safely and supervising the operation of pouring equipment by other employees.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- charge calculations – importance of composition control, methods used to calculate for additions, types of alloy additions and their effects on casting behaviour and finished product
- non-ferrous alloys:
  - definition of non-ferrous metals
  - methods of controlling physical properties
  - advantages/disadvantages of density of each type of non-ferrous metal
  - methods of controlling tensile strength of non-ferrous metals
  - methods of controlling the hardness of non-ferrous metals

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  - influence of melting points on production processes
  - shrinkage percentage of the types of non-ferrous metals
  - how to control metal fluidity
  - refractory selection requirements for non-ferrous alloys
  - use of degassing to control gas defects
  - actions required to control grain size
  - grades of brass, bronze and gunmetal and their applications
  - the grades of other copper, aluminium, lead, zinc, and magnesium based alloys and their applications
  - how to select non-ferrous metal based on required properties
  - how to conduct metal analysis of non-ferrous metals
  - Australian standards (or other appropriate standard) for non-ferrous metals
- types of furnaces and their relative advantages and disadvantages including maintenance requirements
- selection of appropriate refractories for non-ferrous melting – silica, ganister, coatings and others common to non-ferrous melting
- selection of the form of linings for non-ferrous melting – monolithic, castable, rammable and bricks
- selection of the appropriate ladles/crucibles with regard to types, ladles, crucibles, safety and maintenance, including checking of mechanical condition of gearboxes and safety locks, and care of crucibles and porous plug
- supervision of other staff in melting and casting safety, including housekeeping, PPE, dry area and tools, pre-heating of ladles and safe working load of overhead cranes
- furnace operation, including procedures for ensuring a dry and safe charge, warm and dry equipment, pre-heating, scrap selection, scrap segregation, housekeeping, melting schedule, pouring schedule, charge calculations and calculations, including volume and mass calculations and maintenance of melting and pouring equipment
- use of lifting and handling equipment, including tongs, shanks, cranes, hoists, bogey ladles and maintenance
- types of control equipment – thermal analysis, pyrometers, gas analysis, chemical analysis, wet chemical analysis, spectrograph, fluidity test and shrinkage test
- quality control and procedures for accurate weighing, correct chemical analysis, temperature control, covers and fluxes, mould/metal reactions, conduct and interpretation of thermal analysis, degassing, deoxidising, ladle refining and customer requirements
- types of defects and prevention including – contamination, gas absorption, metal analysis, temperature control, oxidation and other defects common to non-ferrous metals
- tapping and pouring operations, including when to pour according to job and furnace specification, availability of emergency pour out pits and other safety equipment, availability of cranes or other transport, pour out rate, ensuring mechanical test bar is available and taken, if required, and ensuring pig pouring and tagging is performed correctly.

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Assessment Conditions

- Assessors must:
  - have vocational competency in the supervision of individual non-ferrous melting and casting operation at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM04022 Examine appropriateness of methoding for mould design

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

Application

This unit of competency defines the skills and knowledge required to examine the methoding (gating, running and feeding of castings) for mould designs using basic metallurgical techniques and skills. This work is under the overall direction of a metallurgist.

It applies to a foundry tradesperson who has to examine the appropriateness of own or others methoding for a mould design using basic metallurgical skills and techniques supported by normal empirical trade skills.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM04024	Produce moulds and cores by hand
MEM04025	Produce moulds and cores by hand (advanced)
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MSATCM304A	Interpret basic binary phase diagrams

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Evaluate proposed mould design for methoding requirements**	2.1	Identify risk management strategies to minimise defect formation
		2.2	Identify desired solidification process and take into account casting design, metal composition, mould design and specifications
		2.3	Identify running, gating and feeding principles and techniques appropriate for the particular casting
		2.4	Identify methods to minimise shrinkage, porosity, segregation, hot tearing and shear
		2.5	Examine suitability of methoding, including gating and the number, placement and sizing of feeders/risers

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.6	Enter data where required to facilitate the generation of a computer simulation of methoding and casting process for later comparison to actual casting
3 **Report results**	3.1	Compare casting results with computer simulated predictions
	3.2	Determine reporting requirements
	3.3	Prepare reports and circulate for feedback and file in accordance with SOPs
	3.4	Communicate suggestions for improvements directly to other team members where appropriate

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Size and number of feeder heads and gating includes the following:	• manual calculation and use of computer programs within defined design parameters

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

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Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04022 Examine appropriateness of methoding for mould design

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- calculating manually, and by use of computer programs, runner and feeding systems for casting designs within defined design parameters
- examining mould designs for suitability against job specifications
- understanding the interplay between moulds, cores, gating and feeding
- examining the resulting casting for success of gating and feeding, including calculation of the size and number of feeder heads and gating
- comparing casting results with computer simulated predictions
- preparing reports, circulating and communicating suggestions for improvements directly to other team members where appropriate and filing report in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- calculations related to methoding and feeding, including:
  - dimensions of runner systems
  - cross-sectional areas of sprue, runners and ingates
  - volumes and dimensions of feeders
- the effects on solidification of:
  - nucleation
  - growth mechanisms (crystal and interfacial)
  - dendrite coherency
  - constitutional undercooling

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  - superheat - effects, control and minimisation of excess heat
  - eutectic and peritectic solidification
  - grain structure
- principles underpinning the effective operation of running, gating and feeding systems, including:
  - runner and gating principles (ratios)
  - determining type and placement of sprue, runners and ingates
  - inclusion control (slag and erosion)
  - calculations and effect of metal flow (lamellar and turbulent), velocity and temperature
  - calculation of feeder size
  - principles used in the determination of the location of feeders (end and feed zones, neighbourhood effect and feeding distances), including effect on solidification, exothermic and insulating feeding aids (sleeves and topping)
  - feeding mechanisms (liquid, mass, interdendritic, burst and solid)
  - use of computer packages (runner and feeder calculations and mould simulations) including benefits and limitations and yield calculations
- risk management strategies to minimise defect formation and the methods for minimising shrinkage, porosity, segregation, hot tearing and shear.

Assessment Conditions

- Assessors must:
  - have vocational competency in examining appropriateness of methoding for mould design at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM04023 Undertake prescribed tests on foundry-related materials

Modification History

Release 1. Supersedes and is equivalent to MEM04023A Undertake prescribed tests on foundry related materials

Application

This unit of competency defines the skills and knowledge required to carry out prescribed chemical analysis and mechanical (destructive) tests on foundry-related materials and compare the results against predetermined specifications. It also includes the conducting of optical emission spectroscopy (OES) testing, but not the conducting of any other tests. This work is performed under the overall direction of a metallurgist.

The foundry tradesperson may be required to draw some conclusions from the results of the specified tests regarding whether an adjustment is required within their skills and knowledge to casting or melting procedures or whether to consult on the results with a metallurgist or other authority according to standard procedures.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM11011 Undertake manual handling

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MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select appropriate testing procedures/ standards**	2.1	Identify the need and relevant test and testing standard from prescribed range of tests and testing standards
		2.2	Arrange for external testing if appropriate
		2.3	Identify appropriate and certified laboratory and test equipment
		2.4	Select appropriate procedures/standards for the requirements of the test
		2.5	Prepare sample according to appropriate procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Undertake prescribed tests**	3.1	Check that the sample or casting has been prepared as required by the test method
		3.2	Prepare sample or casting
		3.3	Prepare instrument as required by procedures
		3.4	Test sample or casting
		3.5	Record and check test results and repeat test results if required
4	**Arrange other tests**	4.1	Identify need for tests not covered by this unit
		4.2	Arrange for internal or external test according to standard enterprise procedures
5	**Report result of tests**	5.1	Identify reporting requirements
		5.2	Source externally conducted test results from provider
		5.3	Determine implications of test results for process or product
		5.4	Undertake or recommend actions to be taken based on test results and enterprise procedures
		5.5	Prepare and circulate report in accordance with enterprise requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Prescribed range of tests include testing one (1) or more of the following:	• tensile strength • compressive strength • elongation • area reduction • yield stress • yield point • proof stress • Young's modulus • elastic/plastic region and deformation • viscoelastic deformation
Other tests include one (1) or more of the following:	• fatigue/flex testing • creep testing • strain test and measurement • static shear and bend test • ultraviolet-visible (UV-VIS) spectrophotometry • infrared spectroscopy (IR) • gas chromatography (GC) • X-ray fluorescence (XRF) • flame photometry • atomic absorption spectrometry (AAS) • scanning electron microscopy (SEM)
Prepare sample includes one (1) or more of the following:	• representative sub-samples have been taken • samples are ground and milled • the sample is ready for the test
Prepare instrument includes one (1) or more of the following:	• checking calibration • ensuring the availability of required consumables • curve generation where OES test is required • setting machine conditions • checking machine function
Materials for mechanical tests include one (1) or	• metals • polymer-based materials

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

more of the following:

- other solid materials on which mechanical testing is relevant

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM04023A Undertake prescribed tests on foundry related materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04023 Undertake prescribed tests on foundry-related materials

Modification History

Release 1. Supersedes and is equivalent to MEM04023A Undertake prescribed tests on foundry related materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting of appropriate test methods from a prescribed range of tests against predetermined specifications and standards
- preparing samples according to appropriate procedures
- ensuring the test instrument is prepared according to specifications, standards and procedures
- conducting tests either in a workplace or suitable laboratory facility, including:
  - selecting appropriate test methods
  - obtaining repeatable results
  - interpreting test results for a foundry
  - obtaining reproducible test results from testing across different samples requiring different sample preparation/test conditions
- arranging other internal/external testing as prescribed
- preparing and circulating reports and filing report in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- standards:
  - needs for standards
  - standards organisations
  - structure and operations of Standards Australia (SA)
- the role of National Association of Testing Australia (NATA):
- tensile testing, methods for tensile testing, e.g. AS 1391-2007 Metallic materials – Tensile testing at ambient temperature or equivalent international standard, and determination of tensile properties

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- general impact testing:
  - factors affecting impact properties of materials, impact testing (AS 1544 Methods for impact tests on metals) or equivalent international standard and drop weight tear test (AS 1330-2004 Metallic materials – Drop weight tear test for ferritic steels) or equivalent international standard
- hardness testing:
  - Vickers hardness testing (AS 1817.1-2003 Metallic materials – Vickers hardness test – Test methods) or equivalent international standard
  - Brinell Hardness Testing (AS 1816.1-2007 Metallic materials Brinell hardness test – Test method) or equivalent international standard
  - Rockwell Hardness Testing (AS 1815.1-2007 Metallic materials – Rockwell harness test – Test methods) or equivalent international standard
  - other hardness testing methods (e.g. Equotip and other rebound methods)
- principles of operation, uses and limitations of optical emission spectroscopy (OES) otherwise known as atomic emission spectroscopy (AES)
- purpose and scope of the following tests to the level required to determine the suitability or otherwise of the test but not to the level of conducting the test or interpreting the test:
  - fatigue/flex testing
  - creep testing
  - strain test and measurement
  - static shear and bend test
  - ultraviolet-visible (UV-VIS) spectrophotometry
  - infrared spectroscopy (IR)
  - gas chromatography (GC)
  - X-ray fluorescence (XRF)
  - flame photometry
  - atomic absorption spectrometry (AAS)
  - scanning electron microscopy (SEM)
- mathematics relevant to the collation and reporting of test data
- impact of chemical composition on the foundry process and product
- potential implications of the variety of adjustments that could be made in response to test results.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking prescribed tests on foundry related materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04024 Produce moulds and cores by hand

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04024 Produce moulds and cores by hand (Release 1).

Release 1. Supersedes but is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Application

This unit of competency defines the skills and knowledge required to use manual (jobbing) methods to produce moulds and cores to specifications for the production of metal castings. It includes the ability to match patterns to job specifications.

Where the selection and use of welding skills is required unit MEM05012 Perform routine manual metal arc welding and unit MEM05050 Perform routine gas metal arc welding, should also be selected as appropriate.

Where lifting and moving moulds and cores requires the use of mobile load shifting equipment or overhead cranes, appropriate manual handling units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Determine sequence of operations, including material selection, job set up, for maximum safety, efficiency and to meet job specifications
2	**Select inspect and prepare pattern equipment**	2.1	Identify pattern and associated equipment from specifications
		2.2	Inspect pattern equipment for conformance to specifications, and identify damaged patterns for repair or replacement
		2.3	Assemble pattern to specification
		2.4	Set up pattern equipment to specification
3	**Make mould and core**	3.1	Position core in prints utilising chaplets and chills, as required, and vent to specification
		3.2	Close mould and check for compliance to component specification
		3.3	Select and position appropriate moulding/core making equipment
		3.4	Select and use appropriate moulding media to produce

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			mould and core to specification
		3.5	Secure mould
		3.6	Select or manufacture pouring basin to specification and position in accordance with procedures
		3.7	Ram up flat back and split pattern moulds and cores with single joints as required
		3.8	Use parting and stripping systems
		3.9	Position and secure vents, risers and runners as required
		3.10	Remove pattern from mould and core box safely and without causing damage to the pattern
		3.11	Inspect and repair mould as required
		3.12	Clean and paint mould and core according to specification using site procedures
4	**Complete work requirements**	4.1	Leave the worksite in a safe state, including clearing all materials/debris and cleaning the worksite
		4.2	Dispose of unwanted treated sand according to SOPs
		4.3	Complete reports/records in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• binders • hardeners • sand additives • mould coatings
Patterns include one (1) or more of the following:	• flatback • double sided plated patterns • split patterns • cored patterns • single sided drag and cope plated patterns
Moulds include one (1) or more of the following:	• flatback/split • cored moulds • plated moulds
Cores include one (1) or more of the following:	• full • half • segment
Mould securing methods include one (1) or more of the following:	• weights • clamps • bolting
Moulding media includes one (1) or more of the following:	• green sand • shell sand • chemically bonded media
Pouring basins include one (1) or more of the following:	• hand • pattern formed
Parting and stripping systems include one (1) or more of the	• dry • wet

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04024 Produce moulds and cores by hand (Release 1).

Release 1. Supersedes but is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04024 Produce moulds and cores by hand

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04024 Produce moulds and cores by hand (Release 1).

Release 1. Supersedes but is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning the production of moulds and cores by hand, including identifying job requirements and materials from instructions or specifications, job set up, and sequence operations for maximum safety and efficiency
- assembling pattern to specification, including selecting, inspecting and setting up pattern equipment to conformance and identifying damaged patterns for repair or replacement
- preparing to produce moulds and cores by positioning core in prints utilising chaplets and chills and vent to specification, closing mould, selecting and positioning appropriate moulding/core making equipment, selecting appropriate moulding media and securing mould
- producing mould and core by selecting or manufacturing a pouring basin, ramming mould and cores with flat joints, using parting and stripping systems, positioning and securing loose pieces, vents, risers and runners, and removing pattern and loose pieces from mould and core box
- inspecting, cleaning, repairing and painting mould according to specification
- disposing of unwanted treated sand according to legislative requirements and SOPs
- completing all proformas and standard workplace forms as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- metal casting process
- pattern types and their application in a casting process
- pattern assembly techniques
- procedures for selecting a moulding box to match job and pattern

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- principles and processes for selection of ancillary components
- sand types and their bonding systems
- compaction processes
- parting and stripping systems
- mould requirements including vents, runners, risers and other methoding requirements
- finishing and closing techniques
- core placement
- pouring requirements
- securing systems
- pattern care and storage
- environmental requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing moulds and cores by hand at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM04025 Produce moulds and cores by hand (advanced)

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04025 Produce moulds and cores by hand (advanced) (Release 1).

Release 1. Supersedes and is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Application

This unit of competency has been developed for Engineering Tradesperson – Casting and Moulding apprenticeship training and the recognition of trade-level skills in the production of moulds and cores using advanced manual (jobbing) methods. It defines the skills and knowledge required to use advanced manual (jobbing) methods to produce moulds and cores for the production of metal castings and includes the ability to match patterns, moulds and cores to meet requirements.

Where the selection and use of welding skills is required unit MEM05012 Perform routine manual metal arc welding and unit MEM05050 Perform routine gas metal arc welding, should also be selected as appropriate.

Where lifting and moving moulds and cores requires the use of mobile load shifting equipment or overhead cranes, appropriate manual handling units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **12**

Pre-requisite Unit

MEM04024	Produce moulds and cores by hand
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Casting and moulding

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Determine sequence of operations, including material selection, job set up, for maximum safety, efficiency and to meet job specifications
2	**Select inspect and prepare pattern equipment**	2.1	Identify pattern and associated equipment from specifications
		2.2	Inspect pattern equipment conformance to specifications, and identify damaged patterns for repair or replacement
		2.3	Assemble pattern to specification

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		2.4 Set up pattern equipment to specification
3	**Make mould and core**	3.1 Position core in prints utilising chaplets and chills, as required, and vent to specification
		3.2 Close mould and check for compliance to component specification
		3.3 Select and position appropriate moulding/core making equipment
		3.4 Select and use appropriate moulding media to produce mould and core to specification
		3.5 Secure mould
		3.6 Select or manufacture pouring basin to specification and position in accordance with procedures
		3.7 Ram up mould and cores with joints and drawbacks as required
		3.8 Use parting and stripping systems
		3.9 Position and secure loose pieces, vents, risers and runners as required
		3.10 Remove pattern and loose pieces from mould and core box in safely and without causing damage to the pattern
		3.11 Inspect and repair mould as required
		3.12 Clean and paint mould and core according to specification using site procedures
4	**Complete work requirements**	4.1 Leave the worksite in a safe state, including clearing all materials/debris and cleaning the worksite
		4.2 Dispose of unwanted treated sand according to SOPs
		4.3 Complete reports/records in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• binders • hardeners • sand additives • mould coatings
Patterns include one (1) or more of the following:	• irregular/uneven • patterns with undercuts • multi-joint • consumable • loose piece patterns • patterns requiring odd sides • core assembly patterns
Moulds include one (1) or more of the following:	• undercut/drawback • irregular/uneven jointed • multi-part moulds
Cores include one (1) or more of the following:	• full • half • segment
Mould securing methods include one (1) or more of the following:	• weights • clamps • bolting
Moulding media includes	• green sand

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• shell sand • chemically bonded media
Pouring basins include one (1) or more of the following:	• hand • pattern formed
Parting and stripping systems include one (1) or more of the following:	• dry • wet

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04025 Produce moulds and cores by hand (advanced) (Release 1).

Release 1. Supersedes and is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM04025 Produce moulds and cores by hand (advanced)

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04025 Produce moulds and cores by hand (advanced) (Release 1).

Release 1. Supersedes and is not equivalent to MEM04005C Produce moulds and cores by hand (jobbing).

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning the production of moulds and cores by hand, including identifying job requirements and materials from drawings, instructions or specifications, job set up, and sequence operations for maximum safety and efficiency
- assembling pattern to specification, including selecting, inspecting and setting up pattern equipment to conformance and identifying damaged patterns for repair or replacement
- preparing to produce moulds and cores by positioning core in prints utilising chaplets and chills and vent to specification, closing mould, selecting and positioning appropriate moulding/core making equipment, selecting appropriate moulding media and securing mould
- producing mould and core by selecting or manufacturing a pouring basin, ramming mould and cores with irregular joints and drawbacks, using parting and stripping systems, positioning and securing loose pieces, vents, risers and runners, and removing pattern and loose pieces from mould and core box
- inspecting, cleaning, repairing and painting mould according to specification
- disposing of unwanted treated sand according to SOPs
- completing all proformas and standard workplace forms as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- metal casting process
- variety of pattern types and their application in a casting process
- pattern assembly techniques
- procedures for selecting a moulding box to match job and pattern

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- principles and processes for selection of ancillary components
- sand types and their bonding systems
- compaction processes
- parting and stripping systems
- mould requirements including vents, runners, risers and other methoding requirements
- finishing and closing techniques
- core placement
- pouring requirements
- securing systems
- pattern care and storage
- environmental requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing moulds and cores by hand (jobbing) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05001 Perform manual soldering/desoldering - electrical/electronic components

Modification History

Release 1. Supersedes and is equivalent to MEM05001B Perform manual soldering/desoldering – electrical/electronic components

Application

This unit of competency defines the skills and knowledge required to perform manual soldering/desoldering for the installation and fabrication of electrical/electronic components.

Where advanced specification and high reliability soldering associated with the installation of electrical/electronic components and in areas where reliability of connections is critical unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare and solder materials**	2.1	Prepare materials to specifications using appropriate tools, equipment, materials and SOPs
		2.2	Select correct soldering techniques, materials and soldering tools
		2.3	Joint, mount, shape materials to specification
		2.4	Observe procedures for the protection of components
		2.5	Apply solder to component and remove excess material using appropriate techniques
		2.6	Undertake inspection and report and record inspection results according to SOPs
3	**Undertake desoldering**	3.1	Select appropriate techniques, desoldering tools and equipment for given task
		3.2	Desolder materials/components and minimise damage to materials/components according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.3 Remove and clean material/components to specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include the following:	• solder • flux
Solder includes one (1) or more of the following:	• solid • resin core • paste
Flux includes one (1) or more of the following:	• resin • powder
Soldering irons include one (1) or more of the following:	• simple • cordless • temperature controlled • soldering station • soldering tweezers • hot knife
Tools used with soldering	• pliers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

irons include one (1) or more of the following:	• side cutters • brushes • files • solder syringes • holding devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05001B Perform manual soldering/desoldering – electrical/electronic components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05001 Perform manual soldering/desoldering - electrical/electronic components

Modification History

Release 1. Supersedes and is equivalent to MEM05001B Perform manual soldering/desoldering – electrical/electronic components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning to solder by selecting appropriate solder, tools and holding devices for protection of components
- soldering materials/components to specification and remove any excess solder
- inspecting solder joints to comply with inspection procedures and record the results
- desoldering materials/components using appropriate techniques to minimise damage and remove and clean to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cleaning solutions and properties and cleaning procedures
- methods of joint preparation
- properties of fluxes and their uses
- heat and damage protection procedures
- procedures for preventing electrostatic discharge damage
- soldered joint testing and inspection procedures
- reworking procedures and precautions.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing manual soldering/desoldering – electrical/electronic components at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05002 Perform high reliability soldering and desoldering

Modification History

Release 1. Supersedes and is equivalent to MEM05002B Perform high reliability soldering and desoldering

Application

This unit of competency defines the skills and knowledge required to perform soldering/desoldering for the installation and fabrication of electrical/electronic components to advanced or military specifications, or where the reliability of electrical connections is critical and where the prevention of damage through electrostatic discharge or other means is required as well as the soldering of electronic surface mount devices (SMD).

It applies to work undertaken on equipment where continuous performance is critical, and this includes work to military specifications in a workshop, laboratory or in situ.

Where manual soldering for the installation and fabrication of electrical/electronic components and where the reliability of connections is not critical unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

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Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare and solder materials/devices**	2.1	Prepare material/device to specification
		2.2	Clean materials/devices to specifications using appropriate materials and SOPs
		2.3	Mount material/device to specifications using appropriate tools and techniques
		2.4	Undertake necessary techniques to protect materials/devices from heat damage
		2.5	Handle printed circuit boards, assemblies and components in such a way as to prevent electrostatic

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		discharge or mechanical damage
	2.6	Undertake soldering using correct and appropriate techniques including appropriate use of flux
3 **Test/inspect soldered joints**	3.1	Carry out test/inspection using appropriate techniques and equipment to ensure compliance with specifications
	3.2	Carry out rework/repair, where required, and inspect/test to meet specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include the following:	• solder • flux
Solder includes one (1) or more of the following:	• solid • resin core • paste
Flux includes one (1) or more of the following:	• resin • powder

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Soldering irons include one (1) or more of the following:	• simple • cordless • temperature controlled • soldering station • soldering tweezers • hot knife
Device includes one (1) or more of the following:	• medical • navigation equipment
Test/inspection includes one (1) or more of the following:	• visual • mechanical • electrical techniques

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05002B Perform high reliability soldering and desoldering

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05002 Perform high reliability soldering and desoldering

Modification History

Release 1. Supersedes and is equivalent to MEM05002B Perform high reliability soldering and desoldering

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning to solder by selecting appropriate and tools and hold, setting up and/or mounting device/component to specifications using appropriate techniques
- handling printed circuit boards, assemblies and components to prevent electrostatic discharge or mechanical damage
- undertaking high-level soldering
- preventing of damage through electrostatic discharge or other means using appropriate techniques
- inspecting/testing soldered joints visually and, where required, mechanically and electrically to ensure compliance with specifications and recording the results
- reworking/repairing faulty joints to specification, including desoldering.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cleaning solutions and properties and cleaning procedures
- methods of joint preparation
- properties of fluxes and their uses
- heat and damage protection procedures
- procedures for preventing electrostatic discharge damage
- soldered joint testing and inspection procedures
- reworking procedures and precautions.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing high reliability soldering and desoldering at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05003 Perform soft soldering

Modification History

Release 1. Supersedes and is equivalent to MEM05003B Perform soft soldering

Application

This unit of competency defines the skills and knowledge required to perform soft soldering applications of ferrous and non-ferrous materials, using straightforward techniques, where heat damage to components or finish of soldered joint is not critical.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Undertake soft soldering**	2.1	Assemble tools, equipment and consumables appropriate to the task and prepare for use
		2.2	Prepare, arrange and check materials to be soldered to ensure solder joint meets specifications, as required
		2.3	Use correct techniques to apply soft solder according to SOPs
		2.4	Clean and check solder joint for compliance to specifications and rectify any identified faults

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Preparation includes one (1) or more of the following:	• cleaning • deburring • twisting of conductors • fluxing
Materials include one (1) or more of the following:	• ferrous • non-ferrous
Tools include one (1) or more of the following:	• all types of soldering irons • direct flame • other heating devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05003B Perform soft soldering

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05003 Perform soft soldering

Modification History

Release 1. Supersedes and is equivalent to MEM05003B Perform soft soldering

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing to soft solder by selecting appropriate tools and preparing materials in accordance with SOPs
- applying soft solder to materials using appropriate techniques
- cleaning and checking solder joint for compliance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- effect of material to be soft soldered on the selection of consumables
- reasons for preparing surfaces prior to soldering
- procedures for rectifying defects in soldered joints.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing soft soldering at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05004 Perform routine oxy fuel gas welding

Modification History

Release 1. Supersedes and is equivalent to MEM05004C Perform routine oxy acetylene welding

Application

This unit of competency defines the skills and knowledge required to prepare materials and perform routine oxy fuel gas welding of mild/low carbon steel and cast iron where the welding is not required to meet an Australian Standard or equivalent.

Where welding is required to meet AS 1554 General Purpose or equivalent codes, work health and safety (WHS) regulations and/or licensing requirements MEM05055 Weld using oxy fuel gas welding process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare equipment for welding**	2.1	Check condition of gas handling equipment
		2.2	Assemble and set up fuel gas welding equipment according to SOPs
		2.3	Determine and set gas pressures
		2.4	Select consumables
3	**Prepare materials for welding**	3.1	Identify location of welds in accordance with job specifications
		3.2	Clean and prepare materials ready for welding
4	**Perform routine welding using oxy fuel gas**	4.1	Weld materials to job requirements
		4.2	Clean welds according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fuel gases include one (1) or more of the following:	• acetylene • liquefied petroleum gas (LPG) • hydrogen
Materials include one (1) or more of the following:	• mild/low carbon steel • cast iron
Consumables include one (1) or more of the following:	• filler rods • fluxes
Welds include the following:	• butt • fillet
Preparation includes one (1) or more of the following:	• preheating • setting up jigs • fixtures • clamps • joint preparation
Fuel gas welding equipment includes the following:	• gas cylinders • hoses • blowpipes • tips and nozzles • regulators • flashback arrestors

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05004C Perform routine oxy acetylene welding

Links

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Assessment Requirements for MEM05004 Perform routine oxy fuel gas welding

Modification History

Release 1. Supersedes and is equivalent to MEM05004C Perform routine oxy acetylene welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- cleaning and preparing materials for welding
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- selecting settings and consumables
- butt and fillet weld materials to comply with specifications
- cleaning welds according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- preparatory requirements
- equipment and equipment settings
- purpose of, and setting up requirements, of:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors

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- fuel gas properties and applications
- weld characteristics.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine oxy fuel gas welding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05005 Carry out mechanical cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05005B Carry out mechanical cutting

Application

This unit of competency defines the skills and knowledge required to set up and operate a range of mechanical cutting and holing equipment.

Typical applications of this unit include cutting for manufacture, production cutting and cutting materials in a maintenance environment.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools for hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where operational maintenance of equipment is required unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
		1.5	Plan use of material to minimise waste
2	**Select/set up machine tooling**	2.1	Select appropriate method/machines to meet specifications
		2.2	Load machines and adjust for operation according to SOPs
		2.3	Select and install tooling to match job requirements
		2.4	Set up and adjust machines according to SOPs
3	**Operate mechanical cutting machine**	3.1	Set appropriate stops and guards and adjust as required
		3.2	Secure and position material as required
		3.3	Operate machine to cut/hole material to meet specifications
		3.4	Check material and adjust machine and/or tooling as required against specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Check material for conformance to specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Machines include one or (1) more of the following:	• guillotines • croppers • cold saws • band saws • automatic saws • abrasive saws
Tooling includes one (1) or more of the following:	• guillotine blades • cropper punches and dies • cold saw blades • band saw blades • automatic saw blades
Materials include one (1) or more of the following:	• ferrous • non-ferrous • non-metallic products
Stops and guards include the following:	• all safety equipment/stops/guards

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05005B Carry out mechanical cutting

Links

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Assessment Requirements for MEM05005 Carry out mechanical cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05005B Carry out mechanical cutting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate cutting machine and tooling and loading material to match job requirements
- setting up and safely operating equipment
- securing and positioning material using a graduated measuring device and adjusting as required in conformance with specifications
- adjusting machine/tooling as required using material in most economical way
- checking material against specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of cutting methods and machines
- effect of materials on the machine tooling, tooling defects and adjustments
- effect of adjustments on the dimensions of the cut material
- applicable tolerances
- methods of marking out materials to ensure minimum wastage.

Assessment Conditions

- Assessors must:
  - have vocational competency in carrying out mechanical cutting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05006 Perform brazing and/or silver soldering

Modification History

Release 1. Supersedes and is equivalent to MEM05006C Perform brazing and/or silver soldering

Application

This unit of competency defines the skills and knowledge required to perform brazing (including braze welding) and/or silver soldering and includes the preparation of materials and equipment and the inspection of the completed work.

It applies to silver soldering and brazing using all grades of silver solder and braze.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required see unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare heating equipment**	2.1	Select the correct process to meet the job specifications
		2.2	Ensure heating equipment is in safe working condition
		2.3	Assemble heating equipment and set up according to SOPs
		2.4	Determine and set gas pressures
3	**Prepare materials**	3.1	Select and prepare consumables
		3.2	Prepare materials using appropriate tools and techniques
		3.3	Assemble/align materials to meet specifications
		3.4	Identify distortion prevention measures and take appropriate action
		3.5	Undertake test run and verify
4	**Braze and/or silver solder**	4.1	Preheat materials as required
		4.2	Apply consumables using appropriate techniques

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.3	Apply jointing material in appropriate quantities
	4.4	Anneal material where required
5 **Inspect joints**	5.1	Remove excess jointing materials
	5.2	Inspect joints and report/record inspection results according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:
- ferrous
- non-ferrous

Fuel gases include one (1) or more of the following:
- acetylene
- liquefied petroleum gas (LPG)
- hydrogen

Heating equipment includes the following:
- gas cylinders
- hoses
- blowpipes
- tips and nozzles
- regulators

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	• flashback arrestors
Consumables include one (1) or more of the following:	• fluxes (resin or powder) • all types of silver solder • brazing grades
Process includes one (1) or more of the following:	• brazing • braze welding • silver soldering

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05006C Perform brazing and/or silver soldering

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05006 Perform brazing and/or silver soldering

Modification History

Release 1. Supersedes and is equivalent to MEM05006C Perform brazing and/or silver soldering

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking condition of equipment
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- preparing to braze and/or silver solder by assembling/aligning materials in an appropriate manner and applying distortion prevention methods to meet specifications
- applying consumables and brazing and/or silver soldering ferrous and non-ferrous materials
- annealing material using appropriate techniques
- inspecting joints and removing excess jointing materials and recording the results.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- potential equipment faults
- reasons for selecting specific methods of assembly/alignment
- procedures for minimising distortion of the materials being brazed/braze welded/silver soldered
- procedures for assembling and setting up the specific heating equipment and reasons for selection
- reasons for selecting specific consumables

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- procedures for preheating the materials to be joined and precautions to be observed
- conducting test runs
- procedures for normalising the temperature of jointed materials and the consequences of inappropriate techniques
- typical applications of brazing/braze welding and silver soldering processes
- procedures for removing excess jointing material
- effects of the use of inappropriate techniques and quantities of jointing material on the performance of the jointed materials
- procedures for inspecting brazed/braze welded/silver soldered joints.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing brazing and or silver soldering at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05007 Perform manual heating and thermal cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05007C Perform manual heating and thermal cutting

Application

This unit of competency defines the skills and knowledge required to perform manual heating, thermal cutting and gouging including the assembly and disassembly and operation of the equipment on a range of materials.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select and set up heating and thermal cutting equipment**	2.1	Select cutting process and/or method appropriate for material
		2.2	Select and assemble appropriate accessories and equipment
		2.3	Ensure equipment is in safe working condition
		2.4	Set up equipment following SOPs
3	**Perform heating and thermal cutting**	3.1	Follow equipment start-up procedures and make adjustments as required
		3.2	Make appropriate cutting allowances
		3.3	Minimise wastage of materials when performing manual heating and thermal cutting
		3.4	Identify defects and take corrective action in accordance with SOPs
		3.5	Heat and cut material to specification
		3.6	Inspect shape/size/length of final product for compliance with specifications

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Cutting includes one (1) or more of the following:	• hand held • self-propelled straight line cutters
Methods include one (1) or more of the following:	• manual • automatic
Fuel gases include one (1) or more of the following:	• acetylene • liquefied petroleum gas (LPG) • hydrogen
Material includes various thicknesses and types of one (1) or more of the following:	• ferrous • non-ferrous • non-metallic
Equipment includes the following:	• gas cylinders • hoses • blowpipes • tips and nozzles • regulators • flashback arrestors

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05007C Perform manual heating and thermal cutting

Links

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Assessment Requirements for MEM05007 Perform manual heating and thermal cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05007C Perform manual heating and thermal cutting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting equipment appropriate to the material
- checking condition of equipment
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- operating equipment to cut materials making appropriate cutting allowances to ensure material is used in most economical way
- identifying defects and taking appropriate remedial action
- heating material to specification
- checking final product for compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cutting processes appropriate to various materials
- heating and cutting specifications
- purpose of, and setting up requirements, of:
  - gas cylinders
  - hoses
  - blowpipes

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  - tips and nozzles
  - regulators
  - flashback arrestors
- tools, equipment, techniques and procedures for heating and cutting
- potential equipment faults
- assembling procedures for equipment and accessories
- equipment pre-checks and operation
- procedures for adjusting heating and cutting equipment
- cutting allowances and reasons for applying them
- procedures and reasons for minimising waste material
- cutting defects and their causes and tools, equipment and techniques required to correct defects.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing manual heating and thermal cutting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05008 Perform advanced manual thermal cutting, gouging and shaping

Modification History

Release 1. Supersedes and is equivalent to MEM05008C Perform advanced manual thermal heating cutting, gouging and shaping

Application

This unit of competency defines the skills and knowledge required to perform advanced manual heating, thermal cutting, gouging and shaping to produce complex internal and external profiles.

Items are cut, shaped or gouged by a variety of methods to satisfy predetermined shape, size and surface finish specifications.

Where the selection and use of tools is required unit MEM18001 Use hand tools, and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select and set up equipment for manual thermal cutting, gouging and shaping**	2.1	Select appropriate cutting process and procedure for material being worked
		2.2	Select and assemble appropriate accessories and equipment
		2.3	Ensure equipment is in safe working condition
		2.4	Set up equipment following SOPs
3	**Perform hand held thermal cutting and shaping**	3.1	Follow equipment start-up procedures
		3.2	Cut material to specifications
		3.3	Identify cutting defects and take corrective action in accordance with SOPs
		3.4	Remove material with minimum loss of sound metal
		3.5	Check final shape/profile/surface finish for compliance with specifications

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Methods include one (1) or more of the following:	• oxy acetylene • oxy/hydrogen • plasma • carbon arc
Cutting and shaping equipment includes the following:	• gas cylinders • hoses • blowpipes • tips and nozzles • regulators • flashback arrestors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05008C Perform advanced manual thermal heating cutting, gouging and shaping

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05008 Perform advanced manual thermal cutting, gouging and shaping

Modification History

Release 1. Supersedes and is equivalent to MEM05008C Perform advanced manual thermal heating cutting, gouging and shaping

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate equipment to manual heat, thermal cut and gouge, including the selection of settings and consumables to specifications
- checking condition of equipment
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- operating equipment to produce complex internal and external profiles with shape/profile/surface finish to predetermined specifications with minimum loss of sound material
- identifying defects and taking appropriate remedial action
- checking final product for compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cutting processes and procedures appropriate to various materials
- potential equipment faults
- heating, cutting and surface finish specifications and procedures
- use and applications of tools, equipment and techniques for heating and cutting
- assembling procedures for equipment and accessories
- equipment settings, pre-checks and operation

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- sources of information and application on equipment settings and consumables
- procedures for adjusting heating and cutting equipment
- cutting allowances and reasons for applying them
- tools, equipment and techniques required to correct cutting defects
- procedures and reasons for minimising waste material
- cutting defects and their causes and tools, equipment and techniques required to correct defects.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced manual thermal cutting, gouging and shaping at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05009 Perform automated thermal cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05009C Perform automated thermal cutting

Application

This unit of competency defines the skills and knowledge required to set up and operate single and multi-headed automated thermal cutting machines for plate and pipe used in heavy engineering.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Set up automated thermal cutting machine**	2.1	Ensure gas handling equipment is in safe working condition
		2.2	Set up material, including correct procedures for stack cutting and nesting, to minimise waste
		2.3	Select appropriate cutting medium and set to specification
		2.4	Determine process requirements from specifications or instructions
		2.5	Set up machine to specifications
		2.6	Establish machine datum to specifications
3	**Operate automated thermal cutting machine**	3.1	Ignite cutting medium, where required, in accordance with SOPs
		3.2	Start machine using correct sequence and SOPs
		3.3	Use powder marking and/or other tracing devices, as required
		3.4	Check final product for compliance with specifications
		3.5	Shut down machine following SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material includes one (1) or more of the following	• ferrous • non-ferrous
Cutting medium includes one (1) or more of the following:	• fuel gases • oxy acetylene • plasma arc • laser
Machine includes one (1) or more of the following:	• single head machines • multi-headed machines • numerically controlled (NC) driven equipment
Where NC machines are used, set up machine to specifications includes one (1) or more of the following:	• selecting programs according to predetermined instructions • loading programs according to predetermined instructions
Tracing devices include one (1) or more of the following:	• powder marking and magnetic • photoelectric tracing devices
Gas handling equipment includes the following:	• gas cylinders • hoses • blowpipes • tips and nozzles • regulators

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- flashback arrestors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05009C Perform automated thermal cutting

Links

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Assessment Requirements for MEM05009 Perform automated thermal cutting

Modification History

Release 1. Supersedes and is equivalent to MEM05009C Perform automated thermal cutting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- setting up materials for stack cutting and nesting to minimise waste and selecting appropriate cutting medium and setting to specifications
- checking condition of machine and equipment
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- setting up and operating single, multi-headed or NC machines to predetermined instructions and establishing machine datum to specifications
- using tracing devices as required
- shutting down machine in accordance with SOPs
- checking final product for compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- purpose of and setting up requirements of:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators

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    - flashback arrestors
- potential machine and equipment faults
- material set-up procedures
- advantages of stack cutting and nesting
- procedures for establishing machine datum
- hazards associated with igniting cutting media
- safety precautions to be taken when starting and shutting down the machine
- procedures for using powder marking and other tracing devices.

Assessment Conditions

- Assessors must:
    - have vocational competency in performing automated thermal cutting at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05010 Apply fabrication, forming and shaping techniques

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05010 Apply fabrication, forming and shaping techniques (Release 1).

Release 1. Supersedes and is equivalent to MEM05010C Apply fabrication, forming and shaping techniques.

Application

This unit of competency has been developed for Engineering Tradesperson – Fabrication apprenticeship training and the recognition of trade-level skills in fabrication, forming and shaping of a wide variety of shapes and products undertaken using a variety of forming and shaping techniques.

Fabrication, forming and shaping is done to specifications interpreted from technical drawings and job specifications using a variety of tools and equipment.

Skills covered by this unit are generally applied in occupational and work situations associated with steel fabrication, boiler making or sheet metal work.

Where heating and thermal cutting is required unit MEM05007 Perform manual heating and thermal cutting should also be selected.

Where marking off/out skills is required unit MEM12007 Mark off/out structural fabrications and shapes should also be selected.

Where welds are required to meet legislative or regulatory requirements appropriate welding units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

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Pre-requisite Unit

MEM05037	Perform geometric development
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select and set up equipment for a**	2.1	Select most appropriate tools and equipment
		2.2	Set up equipment and adjust for operation according to

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	specific operation		SOPs
		2.3	Calculate and determine allowances for shrinkage, thickness and inside/outside measurements
3	**Operate equipment**	3.1	Prepare equipment for forming and shaping
		3.2	Operate and adjust equipment to form and shape material to meet specifications
4	**Form and shape material**	4.1	Level, straighten, roll, press or bend material to specifications/drawings using fabrication techniques
		4.2	Follow correct hot or cold forming techniques
		4.3	Check final product for compliance to specification and rectify, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:	• presses • shapers • benders • rollers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	• drop hammers
Material includes one (1) or more of the following:	• plate • sheet • tube • pipe
Metal includes one (1) or more of the following:	• ferrous • non-ferrous
Forming and shaping include one (1) or more of the following:	• levelling • straightening • rolling • pressing • bending
Forming and shaping is applied to produce one (1) or more of the following:	• pipework • chamfers • cylinders • cones • angles • hoppers • ductwork • square to round • transitions' • lobster backs • tubular shapes, including hand rails, reticulation pipework and mufflers

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05010 Apply fabrication, forming and shaping techniques (Release 1).

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Release 1. Supersedes and is equivalent to MEM05010C Apply fabrication, forming and shaping techniques.

Links

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Assessment Requirements for MEM05010 Apply fabrication, forming and shaping techniques

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05010 Apply fabrication, forming and shaping techniques (Release 1).

Release 1. Supersedes and is equivalent to MEM05010C Apply fabrication, forming and shaping techniques.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting relevant tools and equipment to fabricate, form and shape materials
- setting up and safely operating equipment
- forming and shaping materials
- performing calculations associated with allowances for shrinkage, thickness and inside/outside measurements
- checking final product for compliance with specifications
- rectifying defects.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- hot and cold forming/shaping processes
- machines, tools and equipment required to perform forming/shaping processes and reasons for selection
- equipment adjustments that can be made and the effect on the object being formed/shaped
- calculations to determine allowances
- machine and equipment operation
- material positioning/feeding requirements
- location and function of all safety guards
- defects in formed/shaped materials and required rectification by further work/adjustment.

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Assessment Conditions

- Assessors must:
  - have vocational competency in applying fabrication, forming and shaping techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05011 Assemble fabricated components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05011 Assemble fabricated components (Release 1).

Release 1. Supersedes and is equivalent to MEM05011D Assemble fabricated components.

Application

This unit of competency has been developed for Engineering Tradesperson - Fabrication apprenticeship training and recognition of trade-level skills in the assembly of general fabricated components in plate, pipe and section or sheet in typical applications either on-site or in a fabrication workplace.

Skills covered by this unit are generally applied in occupational and work situations associated with steel fabrication, boilermaking or sheet metal work.

Work may be undertaken individually or as part of a team.

Where assembly involves using pre-constructed jigs unit MEM03001 Perform manual production assembly and unit MEM03003 Perform sheet and plate assembly, should also be selected as appropriate.

Where skills for the assembly of fabricated engineering components are required unit MEM18006 Perform precision fitting of engineering components should also be selected.

Where welds are required to meet legislative or regulatory requirements, then appropriate welding units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

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Pre-requisite Unit

MEM05005	Carry out mechanical cutting
MEM05007	Perform manual heating and thermal cutting
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Plus, one or more of the following, including their prerequisites:

MEM05015	Weld using manual metal arc welding process
MEM05017	Weld using gas metal arc welding process
MEM05019	Weld using gas tungsten arc welding process
MEM05055	Weld using oxy fuel gas welding process

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify assembly and distortion control methods**	2.1	Identify appropriate assembly and distortion control methods
		2.2	Construct jigs from engineering drawings or according to workshop practice, where required
3	**Ensure all components, tools and fixtures for fabrication assembly are available**	3.1	Select most appropriate equipment for assembly tasks
		3.2	Check and assemble all components against drawings and material list
4	**Assemble fabricated components**	4.1	Position material and/or fabricated components and adjust structural alignment and levelling
		4.2	Determine datum line where necessary
		4.3	Apply appropriate distortion prevention/control techniques
		4.4	Check assembled components for position including squareness, level and alignment to specification
		4.5	Apply fixing/joining techniques according to SOPs
		4.6	Check final assembly for compliance with specifications

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Distortion prevention/control techniques includes one (1) or more of the following:	• jigs • fixtures • heat • clamps
Typical applications include one (1) or more of the following:	• transitions • pipe works • structural fabrication • ductwork • general jobbing work • fired and unfired pressure vessels

Components include one (1) or more of the following:	• general fabricated components in either:
	  • plate
	  • pipe and section
	  • sheet

Structural alignment and levelling includes one (1) or more of the following:	• using planes and line straight edges • spirit levels • line levels • squares

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fixing/joining techniques include one (1) or more of the following:	• welding • adhesives • fasteners • rivets

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05011 Assemble fabricated components (Release 1).

Release 1. Supersedes and is equivalent to MEM05011D Assemble fabricated components.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05011 Assemble fabricated components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05011 Assemble fabricated components (Release 1).

Release 1. Supersedes and is equivalent to MEM05011D Assemble fabricated components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- constructing necessary jigs
- planning fabricated component assembly tasks and sequences efficiently and effectively
- aligning material in jigs and using fixtures, tools and equipment as necessary to check the position of all assembled components visually and dimensionally
- marking datum lines in an appropriate manner
- positioning and assembling general fabricated components in accordance with drawing/specifications using accepted engineering trade techniques, practices, processes and workplace procedures either on-site or in a fabrication workshop
- applying appropriate distortion control techniques and checking to ensure compliance of the final assembly with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- methods and techniques for assembly of fabricated components
- jig construction
- effects of distortion of fabricated components and distortion prevention techniques
- uses and interpretation of drawings, specifications and material lists
- characteristics of relevant tools and equipment for determining squareness, level and alignment
- function and determination of datum lines
- fixing/joining techniques, including:
  - welding
  - adhesives

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  - fasteners
  - rivets
- defects associated with the assembly of fabricated components and methods of rectification of defects by rework or adjustment.

Assessment Conditions

- Assessors must:
  - have vocational competency in assembling fabricated components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05012 Perform routine manual metal arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05012C Perform routine manual metal arc welding

Application

This unit of competency defines the skills and knowledge required to carry out routine manual metal arc welding (MMAW) of low carbon mild steel where the welding is not required to meet an Australian Standard or equivalent.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare materials and equipment for welding**	2.1	Identify location of welds in accordance with procedures and job specifications
		2.2	Clean and prepare materials ready for welding
		2.3	Set up welding equipment according to SOPs
		2.4	Select correct electrodes and adjust settings to suit application
3	**Perform routine welding using MMAW**	3.1	Weld materials to job requirements
		3.2	Clean welds according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• butt • fillet
Preparing includes one (1) or more of the following:	• cleaning • setting up jigs • fixtures • clamps • joint preparation
Welding equipment includes the following:	• welding leads • welding machines • electrode holder
Cleaning includes one (1) or more of the following:	• slag and spatter • cleaning • using files • grinders

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05012C Perform routine manual metal arc welding

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05012 Perform routine manual metal arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05012C Perform routine manual metal arc welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing routine manual metal arc welding (MMAW)
- cleaning and preparing materials to specifications
- setting up welding equipment, selecting appropriate electrodes and adjusting settings to suit application
- welding materials to comply with specifications
- cleaning welds for slag and splatter in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- material and equipment preparation
- equipment set-up and settings
- appropriate welding consumables consistent with standard operating procedures
- MMAW processes and properties.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine manual metal arc welding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05013 Perform manual production welding

Modification History

Release 1. Supersedes and is equivalent to MEM05013C Perform manual production welding

Application

This unit of competency covers the skills and knowledge required to perform production welding, including spot welding, in a production environment.

Guidance may be required with respect to equipment settings, choice of consumables, gas mixtures and pressures.

Where automated/production welding is required to be performed unit MEM07024 Operate and monitor machine and process and unit MEM07025 Perform advanced machine and process operation, should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Weld material using appropriate welding process**	2.1	Prepare material for the process to be used following procedures
		2.2	Align material (if required) using dedicated jigs and fixtures
		2.3	Align materials, check alignment and if required adjust alignment using dedicated jigs and fixtures
		2.4	Carry out welding to accepted workplace standards

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material includes one (1) of more of the following:	• metallic, including low carbon steels • non-metallic
Welding includes one (1) or more of the following:	• spot • resistance • hot air • ultrasonic

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05013C Perform manual production welding

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05013 Perform manual production welding

Modification History

Release 1. Supersedes and is equivalent to MEM05013C Perform manual production welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs)and safe work practices
- preparing and aligning material for welding using dedicated jigs and fixtures
- performing tacking or production welding in a production environment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- function and use of jigs and fixtures in production welding
- function, application and operation of welding equipment within the scope of this unit
- material preparation.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing manual production welding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications

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- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05014 Monitor quality of production welding/fabrications

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05014 Monitor quality of production welding/fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05014C Monitor quality of production welding/fabrications.

Application

This unit of competency defines the skills and knowledge required to perform basic inspection of completed or partly completed welded fabrications produced by others in a production environment.

It is used to monitor the quality of production fabrication work where knowledge of the welding techniques and testing procedures is required. Duties are carried out in consultation with an appropriately qualified supervisor or engineer.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations

Plus, one or more of the following including prerequisites

MEM05004	Perform routine oxy fuel gas welding
MEM05012	Perform routine manual metal arc welding
MEM05049	Perform routine gas tungsten arc welding
MEM05050	Perform routine gas metal arc welding
MEM05056	Perform routine flux core arc welding
MEM05057	Perform routine submerged arc welding

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Confirm requirements through consultation with a suitably qualified supervisor or engineer
2	**Monitor quality of welded products**	2.1	Carry out inspection procedures in accordance with SOPs
		2.2	Report non-conforming welds and initiate corrective action according to SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.3	Use pre-set gauges to monitor quality of product
3	**Initiate testing when required**	3.1	Implement test requirements according to SOPs and any legislative or regulatory requirements
4	**Undertake procedures for reporting**	4.1	Collect weld test data in accordance with SOPs
		4.2	Prepare reports as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Inspection procedures include one (1) or more of the following:	• visual • gauges inspections

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05014 Monitor quality of production welding/fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05014C Monitor quality of production welding/fabrications.

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Assessment Requirements for MEM05014 Monitor quality of production welding/fabrications

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05014 Monitor quality of production welding/fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05014C Monitor quality of production welding/fabrications.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- monitoring the quality of completed or partly completed welded fabrications produced by others in a production environment using inspection procedures to specifications
- reporting non-conforming welds and initiating remedial action
- initiating test requirements according to procedures and legislative requirements
- collecting weld test data and preparing reports as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- function of pre-set gauges
- test requirements appropriate to the welded product
- legislative and/or regulatory requirements of the welded product
- reporting and corrective action procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in monitoring the quality of production welding/fabrications at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.

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- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05015 Weld using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05015 Weld using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05015D Weld using manual metal arc welding process.

Application

This unit of competency has been developed for Engineering Tradesperson – Fabrication apprenticeship training and the recognition of trade-level skills in manual metal arc welding (MMAW) on heavy or light metal fabrications. It may also apply to other trade occupations requiring higher level MMAW welding skills.

Weld quality would typically conform to AS 1554 General Purpose, and American Bureau of Shipping (ABS) or equivalent.

Where manual thermal processes associated with preparation, pre-heat and/or post-heat is required unit MEM05007 Perform manual heating and thermal cutting and unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05012	Perform routine manual metal arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for MMAW**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up**	3.1	Identify and select welding equipment and electrodes, accessories and consumables appropriate to the material

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	welding equipment and consumables	3.2	Assemble and set up AC or DC welding equipment
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld to job specification using MMAW**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the	• fillet and butt welds carried out in all positions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Materials include one (1) or more of the following:	• ferrous, including carbon or stainless steel • non-ferrous metals • alloys suitable for MMAW welding
Preparation of materials includes one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps • joint preparation (e.g. bevelling)
Distortion prevention measures include one (1) or more of the following:	• preheating • setting up of jigs • fixtures and clamps
Rectify includes the use of one or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05015 Weld using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05015D Weld using manual metal arc welding process.

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Assessment Requirements for MEM05015 Weld using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05015 Weld using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05015D Weld using manual metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs)and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for welding using manual metal arc welding process (MMAW) to the specified standard
- selecting appropriate weld and joint preparation methods
- consistently weld a range of materials to the specified standard or equivalent using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing weld records related to MMAW onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- material preparation for MMAW
- weld joint preparations
- welding electrode classification
- causes of distortion for materials when welded
- causes of weld defects and methods of rectification
- relationships between amperage, electrode and material
- standards for MMAW, including AS 1554 General Purpose any other equivalent standards.

Assessment Conditions

- Assessors must:

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  - have vocational competency in welding using MMAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05016 Perform advanced welding using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05016 Perform advanced welding using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05016C Perform advanced welding using manual metal arc welding process.

Application

This unit of competency defines the skills and knowledge required to carry out advanced welding using manual metal arc welding (MMAW).

Welds are associated with a range of structural sections and/or plate and/or pipe for general fabrication. Weld quality would typically conform to AS 1554 Structural Purpose or equivalent.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05012	Perform routine manual metal arc welding
MEM05015	Weld using manual metal arc welding process
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble**	3.1	Identify and select welding equipment and electrodes,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	and set up welding equipment and consumables		accessories and consumables appropriate to the material
		3.2	Assemble and set up AC or DC welding equipment
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld joints to specifications using MMAW**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt welds carried out in all positions
Materials include one (1) or more of the following:	• low carbon, stainless and low alloy steel
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures, clamps • joint preparation e.g. bevelling
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05016 Perform advanced welding using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05016C Perform advanced welding using manual metal arc welding process.

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Assessment Requirements for MEM05016 Perform advanced welding using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05016 Perform advanced welding using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05016C Perform advanced welding using manual metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing advanced welding using manual metal arc welding process (MMAW) to Australian Standard 1554 Structural Purpose
- selecting appropriate weld and joint preparation methods
- consistently weld materials to AS 1554 Structural Purpose or equivalent using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to MMAW Structural Purpose onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- properties and characteristics of low carbon, stainless and low alloy steel
- requirements to conform to AS 1554 Structural Purpose or equivalent
- weld specifications and requirements
- different welder identification systems, including numbering, bar coding, paint coding and letter stamps.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced welding using MMAW process at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05017 Weld using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05017 Weld using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05017D Weld using gas metal arc welding process.

Application

This unit of competency has been developed for Engineering Tradesperson - Fabrication apprenticeship training and the recognition of trade-level skills in gas metal arc welding (GMAW) on heavy or light metal fabrications. It may also apply to other trade occupations requiring higher level GMAW welding skills.

Weld quality would typically conform to Australian Standard 1554 General Purpose, and American Bureau of Shipping (ABS) or equivalent.

Where manual thermal processes associated with preparation, pre-heat and/or post-heat is required unit MEM05007 Perform manual heating and thermal cutting and unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05050	Perform routine gas metal arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for GMAW**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification where required
3	**Select, assemble and set up**	3.1	Identify and select welding equipment and electrodes, accessories and consumables appropriate to the material

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	welding equipment and consumables	3.2	Assemble and set up AC or DC welding equipment
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld to job specification using GMAW**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Visually inspect weld joints for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the	• fillet and butt welds carried out in all positions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Materials include one (1) or more of the following:	• ferrous, including carbon or stainless steel • non-ferrous metals • alloys suitable for GMAW
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps • joint preparation (e.g. bevelling)
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) r more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05017 Weld using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05017D Weld using gas metal arc welding process.

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Assessment Requirements for MEM05017 Weld using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05017 Weld using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05017D Weld using gas metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for welding using gas metal arc welding process (GMAW) to the specified standard
- selecting appropriate weld and joint preparation methods
- consistently weld materials to the specified standard or equivalent using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing weld records related to GMAW onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- types of gases and their uses
- relationships between amperage/wire feed, voltage, gas flow, electrode and material
- application of weld metal transfer (short arc and spray)
- correct welding machine, leads, hand pieces and electrodes
- material preparation
- weld joint preparations
- filler wire classification
- causes of distortion for materials when welded
- causes of weld defects and methods of rectification
- standards for GMA welding, including Australian Standard 1554 General Purpose and any other equivalent standards.

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Assessment Conditions

- Assessors must:
  - have vocational competency in welding using GMAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM05018 Perform advanced welding using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05018 Perform advanced welding using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05018C Perform advanced welding using gas metal arc welding process.

Application

This unit of competency defines the skills and knowledge required to carry out advanced welding using gas metal arc welding (GMAW).

Welds are associated with a range of structural sections and/or plate and/or pipe for general fabrication using ferrous and non-ferrous materials. Weld quality would typically conform to AS 1554 Structural Purpose or equivalent.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05017	Weld using gas metal arc welding process
MEM05050	Perform routine gas metal arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble**	3.1	Identify and select welding equipment and electrodes,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	and set up welding equipment and consumables		accessories and consumables appropriate to the material
		3.2	Assemble and set up AC or DC welding equipment
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld joints to specifications using GMAW**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the	• fillet and butt weld carried out in all positions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Materials include one (1) or more of the following:	• low carbon • cast iron • stainless and low alloy steel • aluminium and aluminium alloys
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures, clamps • joint preparation e.g. bevelling
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures, clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05018 Perform advanced welding using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05018C Perform advanced welding using gas metal arc welding process.

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Assessment Requirements for MEM05018 Perform advanced welding using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05018 Perform advanced welding using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05018C Perform advanced welding using gas metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing advanced welding using gas metal arc welding (GMAW) process to AS 1554 Structural Purpose
- selecting appropriate weld and joint preparation methods
- consistently weld materials to AS 1554 Structural Purpose or equivalent using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to GMAW Structural Purpose onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- in-depth knowledge of the properties and characteristics of a wide range of materials
- requirements to conform to AS 1554 Structural Purpose or equivalent
- weld procedures and requirements
- different welder identification systems, including numbering, bar coding, paint coding and letter stamps
- causes of weld defects and methods of rectification.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing advanced welding using GMAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM05019 Weld using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05019 Weld using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05019D Weld using gas tungsten arc welding process.

Application

This unit of competency has been developed for Engineering Tradesperson - Fabrication apprenticeship training and the recognition of trade-level skills in gas tungsten arc welding (GTAW) on heavy or light metal fabrications. It may also apply to other trade occupations requiring higher level GTAW welding skills.

Weld quality would typically conform to AS 1554 General Purpose and American Bureau of Shipping (ABS), or equivalent.

Where manual thermal processes associated with preparation, pre-heat and/or post-heat is required unit MEM05007 Perform manual heating and thermal cutting and unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05049	Perform routine gas tungsten arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for GTAW**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up**	3.1	Identify and select welding equipment and electrodes, accessories and consumables appropriate to the material

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	welding equipment and consumables	3.2	Assemble and set up AC or DC welding equipment
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld to job specification using GTAW**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Visually inspect weld joints for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the	• fillet and butt welds carried out in all positions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Materials include one (1) or more of the following:	• ferrous, including carbon steel or stainless steel • non-ferrous metals • aluminium and other materials suitable for GTAW welding
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs, fixtures and clamps • joint preparation (e.g. bevelling)
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05019 Weld using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05019D Weld using gas tungsten arc welding process.

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Assessment Requirements for MEM05019 Weld using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05019 Weld using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05019D Weld using gas tungsten arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for welding using gas tungsten arc welding process (GTAW) to the specified standard
- selecting appropriate weld and joint preparation methods
- consistently weld materials to the specified standard using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing weld records related to GTAW onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- correct welding machine, leads, hand pieces and electrodes
- material preparation
- joint preparations
- electrode classification
- causes of distortion for materials when welded
- causes of defects and methods of rectification
- relationships between amperage, electrode and material
- types of gases and their uses
- types of electrodes, current settings and high frequency voltage
- filler materials and consumables
- standards for GTAW welding, AS 1554 General Purpose and other equivalent standards.

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Assessment Conditions

- Assessors must:
  - have vocational competency in welding using GTAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM05020 Perform advanced welding using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05020 Perform advanced welding using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05020C Perform advanced welding using gas tungsten arc welding process.

Application

This unit of competency defines the skills and knowledge required to carry out advanced welding using gas tungsten arc welding (GTAW).

Welds are associated with a range of structural sections and/or plate and/or pipe for general fabrication. Weld quality would typically conform to AS 1554 Structural Purpose or equivalent.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05019	Weld using gas tungsten arc welding process
MEM05049	Perform routine gas tungsten arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up welding equipment and consumables**	3.1	Identify and select welding equipment and electrodes, accessories and consumables appropriate to the material
		3.2	Assemble and set up AC or DC welding equipment

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Minimise and rectify distortion**	4.1 Apply appropriate distortion prevention measures
	4.2 Rectify any distortion using appropriate techniques
5 **Weld joints to specifications using GTAW**	5.1 Ensure weld deposit is to specifications
	5.2 Clean joints to specifications
6 **Ensure weld conformance**	6.1 Inspect weld joints visually for conformance to specifications
	6.2 Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
	6.3 Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt welds carried out in all positions
Materials include one (1)	• low carbon • cast iron

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:	• stainless and low alloy steel • aluminium
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs, fixtures and clamps • joint preparation (e.g. bevelling)
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05020 Perform advanced welding using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05020C Perform advanced welding using gas tungsten arc welding process.

Links

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Assessment Requirements for MEM05020 Perform advanced welding using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05020 Perform advanced welding using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05020C Perform advanced welding using gas tungsten arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing advanced welding using gas tungsten arc welding process (GTAW) to AS 1554 Structural Purpose
- selecting appropriate weld and joint preparation methods
- consistently weld materials to AS 1554 Structural Purpose or equivalent using AC or DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to GTAW Structural Purpose onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- in-depth knowledge of the properties and characteristics of a wide range of materials
- requirements to conform to AS 1554 Structural Purpose or equivalent
- weld procedures and requirements
- different welder identification systems, including numbering, bar coding, paint coding, and letter stamps.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced welding using GTAW process at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05022 Perform advanced welding using oxy acetylene welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05022 Perform advanced welding using oxy acetylene welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05022C Perform advanced welding using oxy acetylene welding process.

Application

This unit of competency defines the skills and knowledge required to perform advanced oxy acetylene welding using a range of materials for general fabrication.

Welding quality would meet AS 1554 Special Purpose or equivalent.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM05004	Perform routine oxy fuel gas welding
MEM05007	Perform manual heating and thermal cutting
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM05055	Weld using oxy fuel gas welding process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up**	3.1	Identify and select welding equipment and consumables according to job requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	welding equipment and consumables	3.2	Assemble and set up welding equipment in accordance with SOPs
4	**Weld joints to Australian Standard 1554 SP or equivalent**	4.1	Weld materials to AS 1554 Structural Purpose or equivalent in all positions
		4.2	Interpret instructions, symbols and specifications, including bead size, bead placement and reinforcement in accordance with weld procedure sheet, if available, and SOPs
5	**Ensure weld conformance**	5.1	Inspect weld joints visually for conformance to specifications
		5.2	Remove defects with minimum loss of sound metal using correct and appropriate techniques and tools
		5.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt in the horizontal, vertical and overhead positions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• low carbon steel, plate, pipe, tube and round bar
Fuel gases include one (1) or more of the following:	• acetylene • liquefied petroleum gas (LPG) • hydrogen
Equipment includes the following:	• cylinders • regulators • hoses • torches • tips • flash back arrestors
Consumables include the following:	• appropriate fuel gas • filler rods • fluxes
Preparing materials includes one (1) or more of the following:	• pre-heating • setting up of jigs, fixtures and clamps • joint preparation e.g. bevelling

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05022 Perform advanced welding using oxy acetylene welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05022C Perform advanced welding using oxy acetylene welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05022 Perform advanced welding using oxy acetylene welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05022 Perform advanced welding using oxy acetylene welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05022C Perform advanced welding using oxy acetylene welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing advanced welding using oxy acetylene welding process to AS 1554 Special Purpose or equivalent
- selecting appropriate weld and joint preparation methods
- consistently weld materials in all positions, including fillet and butt in the horizontal, vertical and overhead positions to the specified standard or equivalent while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to oxy acetylene welding Special Purpose onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- preparatory requirements
- purpose and examples of pre-welding and post-welding heating of the weld materials
- appropriate settings for the given task and the selected equipment/consumables
- purpose of reinforcing areas to be welded
- methods of weld defect removal and their application
- material and consumable properties and characteristics
- requirements of AS 1554 Special Purpose or equivalent
- fuel gas properties and applications
- post treatments

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- recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced welding using oxy acetylene welding process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05023 Weld using submerged arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05023C Weld using submerged arc welding process

Application

This unit of competency defines the skills and knowledge required to carry out submerged arc welding (SAW) where the welds are more likely to be associated with heavy rather than with light fabrication.

Weld quality would typically conform to AS 1554 General Purpose or equivalent.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM05057	Perform routine submerged arc welding
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specifications, where required
3	**Select, assemble and set up welding**	3.1	Identify and select welding machine settings and consumables from job requirements, welding procedures and specifications and/or technical drawings

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	equipment and consumables	3.2	Assemble and set up DC welding equipment
		3.3	Undertake test runs and verify in accordance with specifications
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld joints using submerged arc by correct process**	5.1	Deposit pad, butt and fillet welds in flat, and fillet welds in horizontal position, to specification
		5.2	Clean joints to specifications using techniques and tools appropriate to the defect, material and process
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Maintain weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt in flat and horizontal positions
Materials include one (1) or more of the following:	• carbon and stainless steel
Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs, fixtures and clamps • joint preparation e.g. bevelling
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05023C Weld using submerged arc welding process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05023 Weld using submerged arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05023C Weld using submerged arc welding process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for welding using submerged arc welding (SAW) process to AS 1554 General Purpose or equivalent
- selecting appropriate weld and joint preparation methods
- consistently weld materials to the specified standard or equivalent using DC welding machines and electrodes while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to SAW welding onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- main types of fluxes and flux/wire combinations
- typical applications of SAW and common materials
- application of weld metal transfer (short arc and spray)
- material preparation
- joint preparations
- electrode classification
- causes of distortion for materials
- causes of defects and methods of rectification
- requirements of AS 1554 General Purpose or equivalent.

Assessment Conditions

- Assessors must:

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  - have vocational competency in welding using SAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05024 Perform welding supervision

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05024 Perform welding supervision (Release 1).

Release 1. Supersedes and is equivalent to MEM05024B Perform welding supervision.

Application

This unit of competency has been developed for post trade training of advanced engineering fabrication trades people and the recognition of post trade skills instructing and qualifying welders in accordance with weld procedures.

It defines the skills and knowledge required to instruct and qualify welders in accordance with weld procedures, including maintaining quality and safety procedures.

Competencies in this unit are based on wide knowledge of welding science, processes, procedures and technical requirements. Individuals working in this field would hold at least one certificate satisfying the requirements of AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificate 1-9.

The supervision, training and qualification of welders in welding procedures are defined by recognised codes and standards e.g. AS 2214-2004 (R2016) Certification of welding supervisors - Structural steel welding and AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificate 10.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 12

Pre-requisite Unit

MEM05026	Apply welding principles
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine and prepare welding procedure**	2.1	Instruct welders according to SOPs
		2.2	Determine welding parameters in accordance with weld procedures
		2.3	Plan variables and sequence checks against documentation
		2.4	Prepare documentation for record keeping
3	**Qualify welders**	3.1	Train welders in relevant weld procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	to required procedures	3.2	Test welders against relevant weld procedures
		3.3	Maintain welder performance reports against weld procedures
4	**Monitor/ maintain quality assurance and safety procedures**	4.1	Monitor internal quality assurance plan
		4.2	Ensure traceability of materials
		4.3	Ensure welding is supervised to compliance with prescribed specifications and/or documented procedures and/or safety procedures
5	**Prepare documents**	5.1	Record procedure against pre-qualifying procedures
		5.2	Record findings on internal quality assurance plan
6	**Arrange for non-destructive testing and destructive testing**	6.1	Arrange weld tests appropriate to the weld procedure
		6.2	Verify non-destructive testing/destructive testing reports against job requirements and specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05024 Perform welding supervision (Release 1).

Release 1. Supersedes and is equivalent to MEM05024B Perform welding supervision.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05024 Perform welding supervision

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05024 Perform welding supervision (Release 1).

Release 1. Supersedes and is equivalent to MEM05024B Perform welding supervision.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- instructing welders and determining welding parameters in accordance with procedures
- qualifying welders by training and testing against relevant procedures
- monitoring internal quality assurance plan and safety procedures ensuring materials can be traced to their source
- recording weld procedure and findings on internal quality assurance plan
- arranging for non-destructive/destructive testing appropriate to weld procedure and verifying results against specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- welding science, principles and effects of heat treatment
- welding terms, codes and symbols
- welding processes, parameters and relation to weld quality
- welding procedures defined by code and technical requirements
- non-destructive testing.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing welding supervision at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05025 Perform welding/fabrication inspection

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05025 Perform welding/fabrication inspection (Release 1).

Release 1. Supersedes and is equivalent to MEM05025C Perform welding/fabrication inspection.

Application

This unit of competency defines the skills and knowledge required to perform welding/fabrication inspection by selecting, conducting or verifying appropriate non-destructive tests, establishing and validating welding procedures, ensuring quality assurance is carried out and monitoring procedures.

It applies to welding inspection based on knowledge of welding science and metallurgy, mechanical properties of welded joints, heat treatment procedures and national and technical standards. Test procedures and the range of this standard are determined by applicable Australian and/or international standards.

Where the performance of non-destructive testing is required the appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 12

Pre-requisite Unit

MEM05026	Apply welding principles
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select and organise appropriate non-destructive test procedures or verify previous test procedures**	2.1	Select appropriate non-destructive tests and organise/conduct in accordance with SOPs or job specifications
		2.2	Verify results of previous testing procedures
3	**Establish and validate welding procedure**	3.1	Interpret joint design specification and interpret parameters
		3.2	Check variables
		3.3	Document procedures
		3.4	Organise preparation of a test piece and arrange or

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			conduct prescribed tests
		3.5	Interpret test results and prepare report identifying required action
4	**Ensure quality assurance procedures are carried out**	4.1	Check material identification
		4.2	Document movement of material through workshop in-site
		4.3	Witness transferring material test certification numbers
		4.4	Perform identification of consumables in accordance with welding procedures
		4.5	Monitor storage and use of consumables
		4.6	Maintain and review quality records to ensure compliance with requirements
5	**Monitor procedures in process**	5.1	Check material forming
		5.2	Carry out dimensional checks
		5.3	Make final inspection against specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Non-destructive tests include one (1) or more of the following:	• dye penetrant • magnetic particle • radiographic • ultrasound

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05025 Perform welding/fabrication inspection (Release 1).

Release 1. Supersedes and is equivalent to MEM05025C Perform welding/fabrication inspection.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05025 Perform welding/fabrication inspection

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05025 Perform welding/fabrication inspection (Release 1).

Release 1. Supersedes and is equivalent to MEM05025C Perform welding/fabrication inspection.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- organising/conducting appropriate non-destructive tests or verifying results of previous test procedures
- establishing and validating welding procedures by interpreting joint design specification, organising a test piece, interpreting the results and preparing a report identifying action to be taken
- ensuring quality assurance procedures are carried out, including checking identification (material test certification numbers), movement and document material through workshop in-site
- carrying out final inspection of fabrications, including material forming and dimensional checks against specifications
- maintaining and reviewing quality records to ensure compliance.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- types of non-destructive tests, their application and procedures
- welding specifications and procedures for the given weld
- tests/checks to be conducted
- arithmetic operations, formulae and calculations for testing welding/fabrications
- procedures for:
  - initiating the weld tests and obtaining previous weld tests
  - verifying/amending previously established weld test procedures
  - documenting welding procedures and preparing a weld test piece

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  - documenting/recording the movement of material through the workshop and reasons why this is necessary
  - transferring material test certification numbers
  - identifying consumables and reasons for marking consumables for identification purposes
  - using and storing consumables and the consequences of inappropriate use and/or storage of consumables
  - maintaining welding quality records
- reasons for any identified discrepancies between previous and current weld tests
- effects of testing procedures on test results
- parameters and variables affecting the performance of the weld with respect to specifications
- tools, equipment, techniques and procedures necessary to check each variable, form and dimensions of the welded components
- tools, equipment, techniques and procedures to initiate, carry out, obtain and report the prescribed tests results
- discrepancies between the test results and weld specifications and remedial action to be taken to return welds produced to specification
- reasons and methods for correctly marking/identifying weld materials
- person(s) who can witness the transfer of material test certification numbers and reasons why this is important
- storage life of consumables
- welding quality requirements of the relevant code, standard and/or welding procedure.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing welding/fabrication inspection at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM05026 Apply welding principles

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05026 Apply welding principles (Release 1).

Release 1. Supersedes and is equivalent to MEM05026C Apply welding principles.

Application

This unit of competency has been developed for post-trade training of advanced engineering tradespeople and the recognition of post-trade skills in applying welding principles to meet the statutory and regulatory requirements for welding procedures generally associated with the application of one of the units satisfying *AS 1796*-2001 (R2016) *Certification of welders and welding supervisors,* Certificates 1-9.

This unit covers the underpinning knowledge required to satisfy AS 1796-2001 (R2016) *Certification of welders and welding supervisors* and includes knowledge of welding terms, codes and symbols, the effects of heat treatment on metal as it relates to welding, and the logical sequence for a welding process required to be conducted to AS 1796-2001 (R2016) *Certification of welders and welding supervisors*. It covers welding, planning and set up principles for a range of materials and processes.

This unit must be assessed in combination with one of the units satisfying the AS 1796-2001 (R2016) *Certification of welders and welding supervisors,* Certificates 1-9. These units include:

- MEM05042 Perform welds to code standards using flux core arc welding process
- MEM05043 Perform welds to code standards using gas metal arc welding process
- MEM05044 Perform welds to code standards using gas tungsten arc welding process
- MEM05045 Perform pipe welds to code standards using manual metal arc welding process
- MEM05046 Perform welds to code standards using manual metal arc welding process
- MEM05058 Perform welds to code standards using oxy fuel gas welding process.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

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Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Interpret welding terms and symbols correctly
2	**Determine the effects of heat treatment on metal in relation to welding**	2.1	Identify reasons for performing heat treatment
		2.2	Apply processes, including pre-heat/post-heat treatment, stress relieving, normalising and annealing, where appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
3	**Plan the logical sequence of welding operations**	3.1 Apply statutory and safety requirements to welding 3.2 Apply principles of planning and setting up welding 3.3 Prepare welds for testing, where specified

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Statutory and safety requirements include:	• as required by AS 1796-2001 (R2016) Certification of welders and welding supervisors, welding codes
Welding is to AS 1796-2001 (R2016) Certification of welders and welding supervisors and includes one (1) or more of the following:	• flux core arc welding (FCAW) • gas metal arc welding (GMAW) • gas tungsten arc welding (GTAW) • manual metal arc welding (MMAW) • oxy fuel gas welding

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05026 Apply welding principles (Release 1).

Release 1. Supersedes and is equivalent to MEM05026C Apply welding principles.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05026 Apply welding principles

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05026 Apply welding principles (Release 1).

Release 1. Supersedes and is equivalent to MEM05026C Apply welding principles.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting and applying statutory and safety requirements, including welding terms, codes and symbols as required by *AS 1796*-2001 (R2016) *Certification of welders and welding supervisors,* and welding codes for welding processes
- applying appropriate pre- and post-heat treatment processes for a range of welded materials
- setting up weld sequence and preparing materials in a logical manner for welding job.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- welding terminology, including codes and symbols
- heat treatment processes and the effect of heat treatment on metal
- logical sequence for welding processes
- tools, equipment and techniques used in welding.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying welding principles at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.

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- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05027 Perform aluminothermic welding

Modification History

Release 1. Supersedes and is equivalent to MEM05027A Perform aluminothermic welding

Application

This unit of competency defines the skills and knowledge required to weld using the aluminothermic welding process. It includes planning and preparing the welding method, preparing materials and the site for aluminothermic welding, carrying out the welding process in accordance with safe working/regulatory requirements and workplace procedures, checking weld conformance and completing all required documentation.

This unit applies in a maintenance or site environment where the weld quality is not required to meet an Australian Standard. The aluminothermic welding process (commonly referred to as the CADWELD process) is pre-engineered and is used to make welded connections of copper to copper or copper to steel or other metals. It is also used for header cable taps, conductor splices and terminations, and ground rod connections, or for attaching cathodic protection leads to pipes (steel or cast iron), tanks and structures in which no outside source of heat or power is required. A common use is to join copper cables (wire) for use in direct burial (grounding/earthing) applications.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

Work may be undertaken in the field/on-site (as distinct from a production/manufacturing facility) and may be undertaken in a trench. In those situations, MSMOPS363 Organise on-site work, for work on site and MSMPER205 Enter confined space, for work in a trench should also be selected as appropriate. Work will often be undertaken under a permit to work system in which case MSMPER200 Work in accordance with an issued permit and possibly other related permit units should also be selected as appropriate.

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Where the aluminothermic welding process is required for rail track welding, TLIW3015 Weld rail using aluminothermic welding process should be selected from the TLI Transport and Logistics Training Package.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare and plan**	2.1	Identify weld requirements from job instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	for welding	2.2	Obtain permits and other required authorities
		2.3	Identify site and job hazards and implement appropriate hazard control measures
		2.4	Complete pre-site preparations
		2.5	Identify the locations of welds and assess in accordance with SOPs and specifications
		2.6	Clean and prepare surfaces ready for welding
		2.7	Clear site of obstructions and combustible material to minimise risk of accidents and fire
3	**Prepare equipment for welding**	3.1	Set up welding equipment
		3.2	Select consumables to suit application
4	**Perform aluminothermic welding**	4.1	Apply safe welding practices
		4.2	Ensure moulds are fitted and shimmed, sleeved or sealed, as required
		4.3	Pre-heat materials to standard
		4.4	Ensure materials are welded using aluminothermic method in accordance with approved procedures
		4.5	Clean welds
		4.6	Clean and inspect mould
5	**Complete documentation**	5.1	Assess weld conformance in accordance with specifications
		5.2	Complete required reports, documentation and/or records in accordance with workplace requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Work environment includes one (1) or more of the following:	• restricted spaces • exposed conditions • controlled or open environments
Pre-site preparations include one (1) or more of the following:	• checking all required equipment and materials • identifying required personal protective equipment • loading all requirements for the job
Materials to be joined include one (1) or more of the following:	• common steel • copper-clad steel • Columbium • Niobium • brass • wrought iron • stainless steel • cast iron • galvanised and bethanised steel • bronze • silicon bronze
Assessment of weld locations include one (1) or more of the following:	• proximity to existing welds or repairs • substrate integrity issues • preparation of pre-qualification samples
Weld consumables	• aluminothermic powder

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:	• starting powder • metallic disc
Equipment includes one (1) or more of the following:	• mould • lute (sealant) • ignition source • handle clamps • wire brush • mould scraper • gas pre-heating/cutting equipment
PPE includes one or more of the following:	• high visibility clothing • fire retardant overalls or long sleeved shirts and long pants • hearing protection • gauntlet type gloves • welding goggles • safety glasses • safety headwear • safety footwear • portable radios/mobile phones • other safety devices
Procedures and codes include one (1) or more of the following:	• relevant state/territory WHS legislation together with any nationally approved compliance codes and/or guidelines • relevant state/territory environmental protection requirements • legislation • relevant fire regulations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05027A Perform aluminothermic welding

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Links

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Assessment Requirements for MEM05027 Perform aluminothermic welding

Modification History

Release 1. Supersedes and is equivalent to MEM05027A Perform aluminothermic welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from sketches, sketches and verbal or written job instructions for aluminothermic welding, including location of welds
- preparing site for welding by obtaining appropriate permits, identifying site/job hazards and implementing hazard control measures and assessing weld location
- selecting and setting up welding equipment and consumables
- welding materials consistently to specification
- cleaning and inspecting welds for conformance in accordance with SOPs and completing records.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- relevant safety, work health and safety (WHS) and environmental procedures and regulations
- principles of the aluminothermic welding process chemical reaction
- common types of welding imperfections and defects and their causes (e.g. cracks, porosities, mould off centre, stresses in materials, pre-heating offset, sand inclusions and moisture)
- workplace procedures for the welding of materials using the aluminothermic technique
- problems that can occur during the welding of materials using the aluminothermic technique and action that can be taken to report or resolve the problems
- contents of relevant technical manuals and instructions
- characteristics of plant and equipment, hardware and components used in welding activities
- impact on work activities of regulatory requirements
- impact of other work activities on welding integrity
- workplace documentation requirements

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- site inspection techniques.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing aluminothermic welding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations* 2015 or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05036 Repair, replace and/or modify fabrications

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05036 Repair, replace and/or modify fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05036C Repair/replace/modify fabrications.

Application

This unit of competency defines the skills and knowledge required to undertake repair, replacement and/or modifications of fabrications requiring an integrated level of skills in fabrication maintenance and repair and is intended to build on skills covered by the specialist prerequisites.

Where machines and equipment for forming, bending or shaping are required unit MEM05010 Apply fabrication, forming and shaping techniques should also be selected.

Where additional or more complex marking out skills are required see MEM12007 Mark off/out structural fabrications and shapes should also be selected.

Where the selection and use of welding processes are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05005	Carry out mechanical cutting
MEM05007	Perform manual heating and thermal cutting
MEM05011	Assemble fabricated components
MEM05051	Select welding processes

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MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Plus, one or more of the following, including their prerequisites:

MEM05015	Weld using manual metal arc welding process
MEM05017	Weld using gas metal arc welding process
MEM05019	Weld using gas tungsten arc welding process
MEM05047	Weld using flux core arc welding process
MEM05055	Weld using oxy fuel gas welding process

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Inspect fabrication and determine suitability for repair/replacement/modification
2	**Assess and process material requirements**	2.1	Assess material requirements in accordance with relevant codes, manufacturers' specifications and SOPs
		2.2	Obtain/requisition materials
		2.3	Assess and obtain tool and equipment requirements in accordance with SOPs
3	**Prepare materials**	3.1	Prepare fabrication for repair/replacement and/or modification to specification using acceptable workplace practices, tools and equipment
		3.2	Mark out and prepare to specifications with minimum wastage using appropriate principles, tools and equipment
		3.3	Ensure materials are cut, bent, rolled, shaped or formed to specifications using appropriate fabrication techniques/procedures, tools and equipment
		3.4	Mark items for identification, where required
4	**Repair, replace and/or modify fabrication**	4.1	Position/clamp materials for welding using suitable clamping methods, equipment, jigs and fixtures
		4.2	Undertake pre-tack checks and determine compliance with specifications prior to tack welding in position
		4.3	Prepare welding equipment and adjust settings according to requirements
		4.4	Tack weld material or item using appropriate distortion

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		minimisation techniques and procedures
	4.5	Check material or item against specifications prior to welding
	4.6	Weld material or item to specifications using techniques and procedures appropriate to job requirements
5 **Finish and inspect repair, replacements and/or modification**	5.1	Ensure repair, replacement and/or modification is cleaned and finished to specifications using appropriate workplace practices
	5.2	Inspect welds visually to assess weld quality against predetermined specifications
	5.3	Assess completed repair and/or replacement for compliance against specifications
	5.4	Prepare and lodge maintenance report according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fabrication inspection includes one (1) or more of the following:	• determine defects/faults • non-compliance with specifications • repair/replacement/modification

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Marked for identification includes one (1) or more of the following:	• to undergo repair, replacement and/or modification • to be cut, bent, rolled, shaped or formed to specifications
Clamping methods include one (1) or more of the following:	• automatic • semi-automatic • manual methods

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05036 Repair, replace and/or modify fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05036C Repair/replace/modify fabrications.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05036 Repair, replace and/or modify fabrications

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05036 Repair, replace and/or modify fabrications (Release 1).

Release 1. Supersedes and is equivalent to MEM05036C Repair/replace/modify fabrications.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions and inspecting fabrication for defects/faults, non-compliance and determining suitability for repair/replacement/modification
- selecting material, marking out and safely cutting, bending, rolling, shaping or forming ensuring minimum wastage using correct principles, tools, equipment and procedures
- selecting appropriate welding equipment and preparing materials for welding, including pre-tack checks and set up jigs, fixtures and clamps
- consistently welding materials while preventing distortion and rectifying any defects and ensuring repair, replacement and/or modification is cleaned and finished and visually inspected to meet predetermined specifications
- completing and lodging maintenance report.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- characteristics of faults, defects and/or non-compliance and means of rectification by rework or additional work, or by replacement of components/materials
- effects of proposed modifications on the fabrication
- reasons for selection of specific materials, tools, equipment and consumables
- marking out principles and techniques
- material preparation processes
- clamping method(s) for the welds undertaken
- location of all materials to be welded
- weld specifications

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- equipment, consumables and settings required to achieve the weld specification
- distortion minimisation procedures and methods for rectifying any distortion of materials
- material cleaning and finishing processes for the repair/replacement/modification
- reporting requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in repairing, replacing and modifying fabrications at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05037 Perform geometric development

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05037 Perform geometric development (Release 1).

Release 1. Supersedes and is equivalent to MEM05037C Perform geometric development.

Application

This unit of competency has been developed for Engineering Tradesperson – Fabrication apprenticeship training and the recognition of trade-level skills in marking out general fabrications using geometric development techniques.

Marking out associated with geometric development is done to specifications interpreted from technical drawings and job specifications.

This unit applies in jobbing workshops and involves the development of templates and general fabricating using geometrical layout techniques.

Skills covered by this unit are generally applied in occupational and work situations associated with steel fabrication, boiler making or sheet metal work.

For skills required for marking out activities associated with general engineering and maintenance functions, see the following units:

- MEM07005 Perform general machining
- MEM12006 Mark off/out (general engineering)
- MEM18006 Perform precision fitting of engineering components.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM09002 Interpret technical drawing

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Transfer dimensions from a detail drawing to work**	2.1	Determine and apply specifications and work requirements using appropriate calculations
		2.2	Carry out development to specifications or procedures using appropriate tools and equipment
		2.3	Establish datum points and mark appropriate to task requirements
3	**Make templates as required**	3.1	Select appropriate template material
		3.2	Produce templates to specification

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Follow correct storage procedures, including labelling and identification to procedures
4	**Develop patterns as required**	4.1	Select and apply parallel line, radial line and triangulation development methods as appropriate to the work requirements
		4.2	Determine and transfer allowances for fabrication and assembly
5	**Interpret relevant codes, standards and symbols**	5.1	Interpret relevant standards/codes and symbols
		5.2	Interpret requirements of standards/codes and apply to materials and processes
6	**Estimate quantities of materials from detail drawings**	6.1	Identify materials
		6.2	Estimate quantities from drawings
		6.3	Minimise material wastage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Template materials include one (1) or more of the following:	• steel plate • perspex • timber • cardboard • paper
Storage procedures include one (1) or more of the following:	• labelling • identification (e.g. template lofts)
Development methods include one (1) or more of the following:	• parallel line • radial line • triangulation
Allowances include one (1) or more of the following:	• thickness • bend • pitch • angle • circumference • perimeter
Standards/codes and symbols includes:	• carrying out all work in accordance with legislative and regulatory requirements

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05037 Perform geometric development (Release 1).

Release 1. Supersedes and is equivalent to MEM05037C Perform geometric development.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05037 Perform geometric development

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05037 Perform geometric development (Release 1).

Release 1. Supersedes and is equivalent to MEM05037C Perform geometric development.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- examining detailed drawings for fabrication requirements and specifications, including materials, measurements and tolerances, joining methods, standards and code requirements
- calculating allowances for fabrication and assembly
- establishing and marking datum points
- selecting and using parallel line, radial line and triangulation development methods with minimum material wastage and accurate dimensions
- producing templates accurately and following storage procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications of work
- tools and equipment
- development preparation, methods and application
- datum points
- materials used for the preparation of templates
- manufacturing allowance considerations
- template development, labelling, identification and storage requirements
- fabrication and assembly allowances
- sources of data on fabrication and relevant standards and codes.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing geometric development at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the Standards for Registered Training Organisations 2015 or its replacement and comply with the National Vocational Education and Training Regulator Act 2011, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05038 Perform advanced geometric development - cylindrical/rectangular

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05038 Perform advanced geometric development – cylindrical/rectangular (Release 1).

Release 1. Supersedes and is equivalent to MEM05038B Perform advanced geometric development – cylindrical/rectangular.

Application

This unit of competency defines the skills and knowledge required to mark out complex cylindrical/rectangular fabrications and reflects advanced skills required to calculate parallel line developments.

Where the skills required are for marking out activities associated with general engineering and maintenance functions, one or more of the following units should also be selected as appropriate:

- MEM07005 Perform general machining
- MEM12006 Mark off/out (general engineering)
- MEM18006 Perform precision fitting of engineering components
- MEM18014 Manufacture press tools and gauges.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM05037	Perform geometric development
MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering

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	or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Mark off/out light/heavy gauge fabrications**	2.1	Determine and apply specifications and work requirements using appropriate calculations
		2.2	Carry out development to specifications or procedures using appropriate tools and equipment
		2.3	Establish and indicate datum points
		2.4	Determine and mark allowances
3	**Make templates as required**	3.1	Select template material appropriate to the marking out requirements
		3.2	Produce templates to meet specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Determine and transfer allowances
		3.4	Produce templates to specification
		3.5	Follow correct storage procedures, including labelling and identification to procedures
4	**Develop patterns as required**	4.1	Select and apply parallel line, radial line and triangulation development methods, as appropriate, to the work requirements
		4.2	Determine and transfer allowances
5	**Interpret relevant codes, standards and symbols**	5.1	Interpret relevant standards/codes and symbols
		5.2	Interpret and apply requirements of standards/codes to materials and processes
6	**Estimate quantities of materials from engineering drawings**	6.1	Identify materials
		6.2	Estimate quantities from drawings
		6.3	Optimise material use and ensure wastage is minimised

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Light gauge fabrications include one (1) or more of the following:

- square/rectangular ventilation ducting
- air conditioning
- cylindrical components

and include one (1) or more of the following:

- hoppers
- chutes
- other items involving compound bends and double offsets

Heavy gauge fabrications include one (1) or more of the following:

- ducting
- extraction
- piping
- cylindrical components

and include one (1) or more of the following:

- hoppers
- chutes
- other items involving compound bends and double offsets

Allowances include one (1) or more of the following:

- thickness
- bend, pitch
- angle
- circumference
- perimeter

Template material includes one (1) or more of the following:

- steel plate
- perspex
- timber

Templates produced include (1) one or more of the following:

- rolling
- bending
- pressing
- drilling
- profiling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Storage procedures include one or more of the following:	• labelling • identification (e.g. template lofts)
Development methods include the following:	• parallel line • radial line • triangulation

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05038 Perform advanced geometric development – cylindrical/rectangular (Release 1).

Release 1. Supersedes and is equivalent to MEM05038B Perform advanced geometric development – cylindrical/rectangular.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05038 Perform advanced geometric development - cylindrical/rectangular

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05038 Perform advanced geometric development – cylindrical/rectangular (Release 1).

Release 1. Supersedes and is equivalent to MEM05038B Perform advanced geometric development – cylindrical/rectangular.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- examining detailed drawings for fabrication requirements and specifications including materials, quantities, measurements and tolerances, joining methods, standards and code requirements
- calculating and marking allowances for fabrication and assembly
- establishing and marking datum points
- selecting and using parallel line, radial line and triangulation development methods with minimum material wastage with accurate dimensions for fabrications
- producing templates and developing patterns accurately and following storage procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools, equipment and techniques in template/patterns
- datum points
- geometrical principles and formulae
- parallel line, radial line and triangulation development methods as applied to cylindrical/rectangular geometric development
- calculations of allowances, including manufacturers' allowances on materials
- fabrication and assembly allowances and effects of material type/thickness
- sources of data on fabrication/assembly allowances
- materials and procedures for making template/patterns
- template/patterns labelling, identification and storage
- relevant standards, codes and symbols

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- fabrication materials
- optimising material use and minimising material wastage.

Assessment Conditions

- Assessors must:
  - have vocational in performing advanced geometric development – cylindrical/rectangular at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05039 Perform advanced geometric development - conical

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05039 Perform advanced geometric development – conical (Release 1).

Release 1. Supersedes and is equivalent to MEM05039B Perform advanced geometric development – conical.

Application

This unit of competency defines the skills and knowledge required to mark out complex conical fabrications and reflects advanced skills required to calculate cutting, bending lines and developments.

Where the skills required are for marking out activities associated with general engineering and maintenance functions, one or more of the following units should also be selected as appropriate:

- MEM07005 Perform general machining
- MEM12006 Mark off/out (general engineering)
- MEM18006 Perform precision fitting of engineering components
- MEM18014 Manufacture press tools and gauges.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM05037	Perform geometric development
MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Mark off/out light/heavy gauge fabrications**	2.1	Determine and apply specifications and work requirements using appropriate calculations
		2.2	Carry out development to specifications or procedures using appropriate tools and equipment
		2.3	Establish and indicate datum points
		2.4	Determine and mark allowances
3	**Make templates as required**	3.1	Select template material appropriate to the marking out requirements
		3.2	Produce templates to meet specifications
		3.3	Determine and transfer allowances

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Produce templates
		3.5	Follow correct storage procedures, including labelling and identification to procedures
4	**Develop patterns as required**	4.1	Select and apply parallel line, radial line and triangulation development methods, as appropriate, to the work requirements
		4.2	Determine and transfer allowances
5	**Interpret relevant codes, standards and symbols**	5.1	Interpret relevant standards/codes and symbols
		5.2	Interpret requirements of standards/codes and apply to materials and processes
6	**Estimate quantities of materials from engineering drawings**	6.1	Identify materials
		6.2	Estimate quantities from drawing
		6.3	Optimise material use ensure wastage is minimised

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Light gauge fabrications include one (1) or more of the following:	Hoppers with round/rectangular branch intersections used on one (1) or more of the following: • square/rectangular ventilation ducting • air conditioning • cylindrical components
Heavy gauge fabrications include one (1) or more of the following:	Hoppers with round/rectangular branch intersections used on one (1) or more of the following: • ducting • extraction • piping • cylindrical components
Allowances include one (1) or more of the following:	• thickness • bend • pitch • angle • circumference • perimeter
Template materials include one (1) or more of the following:	• steel plate • perspex • timber
Templates produced include one (1) or more of the following:	• rolling • bending • pressing • drilling • profiling • cutting
Storage procedures	• labelling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:	• identification (e.g. template lofts)
Development methods include the following:	• parallel line • radial line • triangulation

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05039 Perform advanced geometric development – conical (Release 1).

Release 1. Supersedes and is equivalent to MEM05039B Perform advanced geometric development – conical.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05039 Perform advanced geometric development - conical

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05039 Perform advanced geometric development – conical (Release 1).

Release 1. Supersedes and is equivalent to MEM05039B Perform advanced geometric development – conical.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- examining detailed drawings for fabrication requirements and specifications, including materials, quantities, measurements and tolerances, joining methods, standards and code requirements
- calculating and marking allowances for fabrication and assembly
- establishing and marking datum points
- selecting and using parallel line, radial line and triangulation development methods for conical development with minimum material wastage with accurate dimensions for fabrications
- producing templates and developing patterns accurately and following storage procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools, equipment and techniques in template/ pattern development
- datum points
- geometrical principles and formulae
- parallel line, radial line and triangulation development methods as applied to conical geometric development
- calculations of allowances, including manufacturers' allowances on materials
- fabrication and assembly allowances and effects of material type/thickness
- sources of data on fabrication/assembly allowances
- materials and procedures for making template/patterns
- template/patterns labelling, identification, storage and development

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- relevant standards, codes and symbols
- fabrication materials
- optimising material use and minimising material wastage.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced geometric development – conical at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05040 Perform advanced geometric development - transitions

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05040 Perform advanced geometric development – transitions (Release 1).

Release 1. Supersedes and is equivalent to MEM05040B Perform advanced geometric development – transitions.

Application

This unit of competency defines the skills and knowledge required to mark out complex and irregular shapes and reflects advanced skills required to calculate cutting, bending lines and developments.

Where the skills required are for marking out activities associated with general engineering and maintenance functions, one or more of the following units should also be selected as appropriate:

- MEM07005 Perform general machining
- MEM12006 Mark off/out (general engineering)
- MEM18006 Perform precision fitting of engineering components
- MEM18014 Manufacture press tools and gauges.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05037 Perform geometric development

MEM09002 Interpret technical drawing

MEM12023 Perform engineering measurements

MEM12024 Perform computations

MEM12026 Perform advanced trade calculations in a manufacturing, engineering or related

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environment

MEM13015 Work safely and effectively in manufacturing and engineering

MEM14006 Plan work activities

MEM16006 Organise and communicate information

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Mark off/out light/heavy gauge fabrications**	2.1	Determine and apply specifications and work requirements using appropriate calculations
		2.2	Carry out development to specifications or procedures using appropriate tools and equipment
		2.3	Establish and indicate datum points
		2.4	Determine and mark allowances
3	**Make templates as required**	3.1	Select appropriate template material to the marking out requirements
		3.2	Produce templates

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Determine and transfer allowances
		3.4	Produce templates to meet specifications
		3.5	Follow correct storage procedures, including labelling and identification to procedures
4	**Develop patterns as required**	4.1	Select and apply parallel line, radial line and triangulation development methods, as appropriate, to the work requirements
		4.2	Determine and transfer allowances
5	**Interpret relevant codes, standards and symbols**	5.1	Interpret relevant standards/codes and symbols
		5.2	Interpret and apply requirements of standards/codes to materials and processes
6	**Estimate quantities of materials from engineering drawings**	6.1	Identify materials
		6.2	Estimate quantities from drawings
		6.3	Optimise material use and ensure wastage is minimised

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Light gauge fabrications include one (1) or more of the following:

- square/rectangular ventilation ducting
- air conditioning
- cylindrical components

and include one (1) or more of the following:

- elliptical shapes
- curves
- spirals

Heavy gauge fabrications include one (1) or more of the following:

- ducting
- extraction
- piping
- cylindrical components

and include one (1) or more of the following:

- elliptical shapes
- curves
- spirals

Allowances include one (1) or more of the following:

- thickness
- bend
- pitch
- angle
- circumference
- perimeter
- contraction

Template materials include one (1) or more of the following:

- steel plate
- perspex
- timber

Templates produced include one (1) or more of the following:

- rolling
- bending
- pressing
- drilling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- profiling
- cutting

Storage procedures include one (1) or more of the following:

- labelling
- identification (e.g. template lofts)

Development methods include the following:

- parallel line
- radial line
- triangulation

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05040 Perform advanced geometric development – transitions (Release 1).

Release 1. Supersedes and is equivalent to MEM05040B Perform advanced geometric development – transitions.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05040 Perform advanced geometric development - transitions

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05040 Perform advanced geometric development – transitions (Release 1).

Release 1. Supersedes and is equivalent to MEM05040B Perform advanced geometric development – transitions.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- examining detailed drawings for fabrication requirements and specifications, including materials, quantities, measurements and tolerances, joining methods, standards and code requirements
- calculating and marking allowances for fabrication and assembly
- establishing and marking datum points
- selecting and using parallel line, radial line and triangulation development methods with minimum material wastage with accurate dimensions for fabrications
- producing templates and developing patterns accurately and following storage procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools, equipment and techniques in template/patterns
- datum points
- geometrical principles and formulae
- parallel line, radial line and triangulation development methods as applied to transitions geometric development
- calculations of allowances, including manufacturers' allowances on materials
- fabrication and assembly allowances and effects of material type/thickness
- sources of data on fabrication/assembly allowances
- materials and procedures for making template/patterns
- template/patterns labelling, identification and storage
- relevant standards, codes and symbols

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- fabrication materials
- optimising material use and minimising material wastage.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced geometric development – transitions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05041 Weld using flame powder spraying

Modification History

Release 1. Supersedes and is equivalent to MEM05041B Weld using powder flame spraying

Application

This unit of competency defines the skills and knowledge required to perform flame powder spraying, on a range of heavy or light materials and applies to welding of materials using powder spraying equipment where powders are fed through the flame and are deposited onto the surface to be built up or joined.

Weld quality could include welding that conforms to Australian Standard 1554 General Purpose and American Bureau of Shipping (ABS) or equivalent.

For remedial action using machining processes other than grinding with grinding wheels (ceramic or other) appropriate machining units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05004	Perform routine oxy fuel gas welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM05055	Weld using oxy fuel gas welding process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare work for spray welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align work to specifications, as required
3	**Select, assemble and set up spray welding equipment and powders**	3.1	Select appropriate spray welding equipment and consumables for materials and work requirements
		3.2	Ensure powder flame spray welding equipment is in safe working condition
		3.3	Assemble welding equipment and set up in accordance

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		with SOPs
	3.4	Adjust gas setting on spray welding equipment to task requirements
4 **Minimise and rectify distortion**	4.1	Identify distortion prevention/control measures
	4.2	Apply appropriate distortion prevention/control measures to minimise and rectify distortion
	4.3	Deposit spray weld to specification
5 **Inspect spray weld**	5.1	Inspect weld area/joints visually against specification
	5.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet • butt
Weld positions include	• horizontal

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

the following:	• vertical • overhead
Materials include one (1) or more of the following:	• steels • carbon steels • cast iron • non-metallic materials (plastic/nylon)
Equipment includes the following:	• gas cylinders • hoses • blowpipes • tips and nozzles • regulators • flashback arrestors

Preparation and distortion prevention include one (1) or more of the following:	• pre-heating
	• setting up:
	  • jigs
	  • fixtures
	  • clamps
	• joint preparation

Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices
Defects include one (1) or more of the following:	• porosity • slag inclusions • discontinuities • lack of penetration • undercut

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05041B Weld using powder flame spraying

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05041 Weld using flame powder spraying

Modification History

Release 1. Supersedes and is equivalent to MEM05041B Weld using powder flame spraying

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking condition of equipment
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- identifying and interpreting specifications from sketches and verbal or written job instructions for powder spraying using hot and/or cold processes
- selecting appropriate weld and joint preparation methods
- welding materials to job requirements while preventing distortion
- rectifying any defects.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- potential equipment faults
- correct welding equipment, hoses, tips, hand pieces and filler powder
- purpose of, and setting up requirements, of:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators

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  - flashback arrestors
- procedures and processes for material preparation
- procedures and processes for joint preparations
- causes of distortion for materials
- causes of defects and methods of rectification.

Assessment Conditions

- Assessors must:
  - have vocational competency in welding using powder flame spraying at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05042 Perform welds to code standards using flux core arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05042 Perform welds to code standards using flux core arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05042B Perform welds to code standards using flux core arc welding process.

Application

This unit of competency defines the skills and knowledge required to prepare and produce welds to code standards using flux core arc welding (FCAW) and applies to the production of butt and fillet welds in all positions on a range of materials.

Welds produced to the standard of this unit would typically conform to AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX, or equivalent. This unit, in conjunction with unit MEM05026 Apply welding principles, may satisfy the requirements of AS 1796-2006 (R2016) Certification of welders and welding supervisors, Certificate 8F.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05026	Apply welding principles
MEM05047	Weld using flux core arc welding process
MEM05048	Perform advanced welding using flux core arc welding process
MEM05051	Select welding processes
MEM05052	Apply safe welding practices

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MEM05056	Perform routine flux core arc welding
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare welding materials and equipment for**	2.1	Prepare materials to produce weld to code standard
		2.2	Perform routine maintenance on welding equipment

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	FCAW welding to code standard	2.3	Set up welding equipment
3	**Weld joints using FCAW to procedure specifications**	3.1	Weld materials according to weld procedure specification
		3.2	Rectify discontinuities to ensure compliance to code requirements
		3.3	Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• ensuring gun, cable and contact tip are in good condition
Preparation includes one (1) or more of the following:	• flame cut and ground or machined • pre-heating • setting up of jigs, fixtures, clamps
Materials include (1) one or more of the following:	• carbon/manganese steel on plate, pipe and rolled sections • low alloy steel on plate, pipe and rolled steel sections

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05042 Perform welds to code standards using flux core arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05042B Perform welds to code standards using flux core arc welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05042 Perform welds to code standards using flux core arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05042 Perform welds to code standards using flux core arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05042B Perform welds to code standards using flux core arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing welds using flux core arc welding (FCAW) to code standards
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to FCAW to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX, or equivalent
- relevant standards or codes
- methods for preparing plate and pipe for code standard welding
- pre-welding and post-welding heating methods and requirements for plate and pipe welding to code standard
- requirements for maintaining weld records to code standard.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing welds to code standards using FCAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05043 Perform welds to code standards using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05043 Perform welds to code standards using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05043B Perform welds to code standards using gas metal arc welding process.

Application

This unit of competency defines the skills and knowledge required to prepare and produce welds to code standards using gas metal arc welding (GMAW) on a range of materials.

Butt and fillet welds in the flat, horizontal, vertical and overhead positions would be applied to meet AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Engineers (ASME) IX or equivalent.

This unit, in conjunction with Unit MEM05026 Apply welding principles, may satisfy the requirements of AS 1796-2001 (R2016) Certification of welders and welding supervisors Certificate 8G.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05017	Weld using gas metal arc welding process
MEM05018	Perform advanced welding using gas metal arc welding process
MEM05026	Apply welding principles
MEM05050	Perform routine gas metal arc welding

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MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare welding**	2.1	Prepare materials to produce weld to code standard

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
	materials and equipment for GMAW welding to code standard	2.2 Perform routine maintenance on welding equipment
		2.3 Set up welding equipment
3	**Weld joints using GMAW to procedure specifications**	3.1 Weld materials in accordance with weld procedure specification
		3.2 Rectify discontinuities to ensure compliance to code requirements
		3.3 Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• ensuring gun, liner and contact tip are in good condition
Preparation includes one (1) or more of the following:	• flame cut and ground or machined • pre-heating • setting up of jigs, fixtures and clamps
Materials include one (1) or more of the following:	• carbon/manganese steel on plate, pipe and rolled sections • low alloy steel on plate, pipe and rolled steel sections • aluminium on plate, pipe and rolled sections

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05043 Perform welds to code standards using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05043B Perform welds to code standards using gas metal arc welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05043 Perform welds to code standards using gas metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05043 Perform welds to code standards using gas metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05043B Perform welds to code standards using gas metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing welds using gas metal arc welding (GMAW) to code standards
- cleaning and preparing materials to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to GMAW to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent
- relevant standards or codes
- methods for preparing plate and pipe for code standard welding
- pre-welding and post-welding heating methods and requirements for plate and pipe welding to code standard
- requirements for maintaining weld records to code standard.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing welds to code standards using gas metal arc welding process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05044 Perform welds to code standards using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05044 Perform welds to code standards using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05044B Perform welds to code standards using gas tungsten arc welding process.

Application

This unit of competency defines the skills and knowledge required to prepare and produce welds to code standards using gas tungsten arc welding (GTAW) on a range of materials.

Butt and fillet welds in the flat, horizontal, vertical and overhead positions would be applied to meet AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent. The unit, together with unit MEM05026 Apply welding principles, may satisfy the requirements of AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificate 7.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05019	Weld using gas tungsten arc welding process
MEM05020	Perform advanced welding using gas tungsten arc welding process
MEM05026	Apply welding principles

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MEM05049	Perform routine gas tungsten arc welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Prepare welding materials and equipment for GTAW welding to code standard**	2.1	Prepare materials to produce weld to code standard
		2.2	Perform routine maintenance on welding equipment
		2.3	Set up welding equipment
3	**Weld joints using GTAW to procedure specifications**	3.1	Weld materials in accordance with weld procedure specification
		3.2	Rectify discontinuities to ensure compliance to code requirements
		3.3	Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• ensuring hand piece, gas shroud and flow meter are in good condition
Preparation includes one (1) or more of the following:	• flame cut and ground or machined • preheating • setting up of jigs, fixtures and clamps
Materials include one (1)	• carbon/manganese steel on plate, pipe and rolled sections

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:

- low alloy steel on plate, pipe and rolled steel sections
- aluminium on plate, pipe and rolled sections

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05044 Perform welds to code standards using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05044B Perform welds to code standards using gas tungsten arc welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05044 Perform welds to code standards using gas tungsten arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05044 Perform welds to code standards using gas tungsten arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05044B Perform welds to code standards using gas tungsten arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing welds using gas tungsten arc welding (GTAW) to code standards
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to GTAW to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) or equivalent
- relevant standards or codes
- methods for preparing plate and pipe for code standard welding
- pre-welding and post-welding heating methods and requirements for plate and pipe welding to code standard
- requirements for maintaining weld records to code standard.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing welds to code standards using gas tungsten arc welding process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05045 Perform pipe welds to code standards using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05045 Perform pipe welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05045B Perform pipe welds to code standards using manual metal arc welding process.

Application

This unit of competency defines the skills and knowledge required to prepare and produce pipe welds to code standards using manual metal arc welding (MMAW) on a range of materials.

Butt welds in pipe with the axis horizontal, vertical and/or askew would be applied to meet AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent. The unit, together with unit MEM05026 Apply welding principles, may satisfy the requirements of AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificates 2 and 4.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05012	Perform routine manual metal arc welding
MEM05015	Weld using manual metal arc welding process
MEM05016	Perform advanced welding using manual metal arc welding

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	process
MEM05026	Apply welding principles
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Prepare welding materials and equipment for MMAW pipe welding to code standards**	2.1	Prepare materials to produce pipe weld to code standard
		2.2	Perform routine maintenance on welding equipment
		2.3	Set up welding equipment
3	**Weld pipe using MMAW to procedure specifications**	3.1	Weld materials in accordance with weld procedure specification
		3.2	Rectify discontinuities to ensure compliance to code requirements
		3.3	Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• ensuring leads and hand pieces are in good condition and the correct current carrying capacity
Preparation includes one (1) or more of the following:	• flame cut and ground or machined • pre-heating • setting up of jigs, fixtures and clamps

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• carbon/manganese steel • stainless steel • low alloy steel

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05045 Perform pipe welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05045B Perform pipe welds to code standards using manual metal arc welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05045 Perform pipe welds to code standards using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05045 Perform pipe welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05045B Perform pipe welds to code standards using manual metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing pipes welds using manual metal arc welding (MMAW) to code standards
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to MMAW to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent
- relevant standards or codes
- methods for preparing pipe for code standard welding
- pre-welding and post-welding heating methods and requirements for pipe welding to code standard
- requirements for maintaining weld records to code standard.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing pipe welds to code standards using MMAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05046 Perform welds to code standards using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05046 Perform welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05046B Perform welds to code standards using manual metal arc welding process.

Application

This unit of competency defines the skills and knowledge required to prepare and produce welds to code standards using manual metal arc welding (MMAW) on a range of materials.

Butt and fillet welds in the flat, horizontal, vertical and overhead positions would be applied to meet AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent. This unit, together with unit MEM05026 Apply welding principles, may satisfy the requirements of AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificates 1, 1E, 3 and 3E.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05012	Perform routine manual metal arc welding
MEM05015	Weld using manual metal arc welding process
MEM05016	Perform advanced welding using manual metal arc welding

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	process
MEM05026	Apply welding principles
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Prepare welding materials and equipment for MMAW welding to code standard**	2.1	Prepare materials to produce weld to code standard
		2.2	Perform routine maintenance on welding equipment
		2.3	Set up welding equipment
3	**Weld joints using MMAW to procedure specifications**	3.1	Weld materials in accordance with weld procedure specification
		3.2	Rectify discontinuities to ensure compliance to code requirements
		3.3	Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• ensuring leads and hand pieces are in good condition and the correct current carrying capacity
Preparation includes one (1) or more of the following:	• flame cut and ground or machined • preheating • setting up of jigs, fixtures and clamps
Materials include one (1)	• carbon/manganese steel

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:

- stainless steel
- low alloy steel

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05046 Perform welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05046B Perform welds to code standards using manual metal arc welding process.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05046 Perform welds to code standards using manual metal arc welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05046 Perform welds to code standards using manual metal arc welding process (Release 1).

Release 1. Supersedes and is equivalent to MEM05046B Perform welds to code standards using manual metal arc welding process.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing welds using manual metal arc welding (MMAW) to code standards
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to MMAW to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent
- relevant standards or codes
- methods for preparing plate for code standard welding
- pre-welding and post-welding heating methods and requirements for plate welding to code standard
- requirements for maintaining weld records to code standard.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing welds to code standards using MMAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05047 Weld using flux core arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05047B Weld using flux core arc welding process

Application

This unit of competency defines the skills and knowledge required to perform flux core arc welding (FCAW) on heavy or light metal fabrications.

Weld quality would conform to AS 1554 General Purpose and American Bureau of Shipping (ABS) or equivalent.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where thermal processes, hand and/or power tools are required the appropriate specialisation units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM05056	Perform routine flux core arc welding
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials for FCAW**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up welding equipment and consumables**	3.1	Identify and select welding machine settings, accessories and consumables appropriate to the material
		3.2	Assemble and set up semi-automatic machines

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Minimise and rectify distortion**	4.1 Apply appropriate distortion prevention measures
	4.2 Rectify any distortion using appropriate techniques
5 **Weld to job specification using FCAW**	5.1 Ensure weld deposit is to specification
	5.2 Clean joints to specifications
6 **Ensure weld conformance**	6.1 Inspect weld joints visually for conformance to specifications
	6.2 Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
	6.3 Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt welds carried out in all positions
Materials include one (1) or more of the	• carbon steel • stainless steel

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Preparation includes one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Consumables include one (1) or more of the following:	• gas or gasless wire • a range of gases
Distortion prevention measures include one (1) or more of the following:	• pre-heating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05047B Weld using flux core arc welding process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05047 Weld using flux core arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05047B Weld using flux core arc welding process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from sketches and verbal or written job instructions for welding using flux core arc welding process (FCAW) to the specified standard
- selecting appropriate weld and joint preparation methods
- consistently weld materials to the specified standard or equivalent using semi-automatic machines and consumables while preventing distortion
- rectifying any defects
- completing weld records related to FCAW onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- types of gases and their uses
- relationships between amperage/wire feed, voltage, gas flow, electrode, contact tip and material
- material preparation
- polarity
- electrode stickout
- joint preparations
- electrode classification
- causes of distortion for materials when welded
- causes of weld defects and methods of rectification
- standards for FCAW, including AS 1554 General Purpose and any other equivalent standards.

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Assessment Conditions

- Assessors must:
  - have vocational competency in welding using flux core arc welding process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05048 Perform advanced welding using flux core arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05048B Perform advanced welding using flux core arc welding process

Application

This unit of competency defines the skills and knowledge required to carry out advanced welding using flux core arc welding (FCAW).

Welds are associated with a range of structural sections and/or plate and/or pipe for general fabrication using ferrous materials. Weld quality would typically conform to AS 1554 Structural Purpose or equivalent.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05047	Weld using flux core arc welding process
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM05056	Perform routine flux core arc welding
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for welding**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up welding equipment and consumables**	3.1	Identify and select welding equipment and consumables appropriate to the material
		3.2	Assemble and adjust appropriate welding equipment

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld joints to specifications using FCAW**	5.1	Ensure welds are deposited to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• fillet and butt in horizontal, vertical and overhead positions
Welding equipment includes the following:	• gases, settings, electrodes and related equipment selected in accordance with welding procedure
Materials include one	• low carbon

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

(1) or more of the following:	• cast iron • stainless and low alloy steel
Preparation includes one (1) or more of the following:	• preheating • setting up of jigs • fixtures and clamps
Rectify includes the use of one (1) or more of the following:	• oxy acetylene • air arc equipment • grinding devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05048B Perform advanced welding using flux core arc welding process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05048 Perform advanced welding using flux core arc welding process

Modification History

Release 1. Supersedes and is equivalent to MEM05048B Perform advanced welding using flux core arc welding process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing advanced welding using flux core arc welding process (FCAW) to the specified standard
- selecting appropriate weld and joint preparation methods
- consistently weld materials to the specified standard or equivalent using semi-automatic welding machines and electrodes while preventing distortion
- rectifying any defects
- completing and maintaining weld records related to FCAW Structural Purpose onto standard workplace forms

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- in-depth knowledge of the properties and characteristics of a wide range of materials
- requirements to conform to AS 1554 Structural Propose or equivalent
- weld procedures and requirements
- purpose of pre-welding and/or post-welding heating and the methods of application
- instructions, symbols, specifications, including bead size, bead placement, reinforcement and weld procedure sheet
- discontinuities in relation to standards/requirements
- different welder identification systems, including numbering, bar coding, paint coding and letter stamps.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing advanced FCAW at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05049 Perform routine gas tungsten arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05049B Perform routine gas tungsten arc welding

Application

This unit of competency defines the skills and knowledge required to prepare the materials and carry out routine gas tungsten arc welding (GTAW) and applies in a maintenance or manufacturing environment where the weld quality is not required to meet an Australian Standard.

Where welding is required to meet AS 1554 General Purpose or equivalent codes, work health and safety (WHS) regulations and/or licensing requirements Unit MEM05019 Weld using gas tungsten arc welding process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials and equipment for welding**	2.1	Identify location of welds in accordance with procedures and job specifications
		2.2	Clean and prepare materials ready for welding
		2.3	Set up welding equipment to meet work requirement
		2.4	Select settings and consumables to suit application
3	**Perform routine welding using GTAW**	3.1	Weld materials to job requirements
		3.2	Clean welds according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• butt • fillet
Materials include one (1) or more of the following:	• low carbon/mild steels • aluminium
Prepared includes one (1) or more of the following:	• pre-heating • setting up jigs • fixtures • clamps • joint preparation
Welding equipment includes the following:	• hoses • welding leads and gas shrouds • electrodes • gas regulator • liners • contact tips
Consumables include the following:	• tungsten electrodes, filler wire and shielding gas
Clean includes the following:	• slag and spatter

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05049B Perform routine gas tungsten arc welding

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Assessment Requirements for MEM05049 Perform routine gas tungsten arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05049B Perform routine gas tungsten arc welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from sketches and verbal or written job instructions for performing routine gas tungsten arc welding (GTAW)
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including selecting settings and consumables to suit application
- consistently welding materials to specifications
- cleaning welds in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- preparatory requirements
- equipment and equipment settings
- shielding gas properties and applications
- weld characteristics.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine GTAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05050 Perform routine gas metal arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05050B Perform routine gas metal arc welding

Application

This unit of competency defines the skills and knowledge required to prepare materials and carry out routine gas metal arc welding (GMAW) and applies in a maintenance or manufacturing environment where the weld quality is not required to meet an Australian Standard or equivalent.

Where welding is required to meet AS 1554 General Purpose or equivalent codes, work health and safety (WHS) regulations and/or licensing requirements unit MEM05017 Weld using gas metal arc welding process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials and equipment for welding**	2.1	Identify location of welds in accordance with procedures and job specifications
		2.2	Clean and prepare materials ready for welding
		2.3	Set up welding equipment to meet work requirement
		2.4	Select settings and consumables to suit application
3	**Perform routine welding using GMAW**	3.1	Weld materials to job requirements
		3.2	Clean welds according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• butt • fillet
Materials include one (1) or more of the following:	• low carbon • mild steels
Prepared includes one (1) or more of the following:	• pre-heating • setting up jigs • fixtures • clamps • joint preparation
Welding equipment includes the following:	• hoses • welding leads and gas shrouds • gas regulators • liners • contact tips
Consumables include the following:	• filler wire and shielding gas
Clean includes the following:	• slag and spatter

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM05050B Perform routine gas metal arc welding

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05050 Perform routine gas metal arc welding

Modification History

Release 1. Supersedes and is equivalent to MEM05050B Perform routine gas metal arc welding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying and interpreting specifications from sketches and verbal or written job instructions for performing routine gas metal arc welding (GMAW)
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including selecting settings and consumables to suit application
- consistently welding materials to specifications
- cleaning welds in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- different current and voltage settings, gas flow rates wire diameters, wire feed speed and other variables to suit typical situations
- material and equipment preparation
- properties and characteristics of materials and consumables
- equipment and equipment settings
- shielding gas properties and applications
- post-welding treatments
- weld characteristics.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine GMAW process at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05051 Select welding processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05051 Select welding processes (Release 1).

Release 1. Supersedes and is equivalent to MEM05051A Select welding processes.

Application

This unit of competency defines the skills and knowledge required to identify material properties and select appropriate welding processes that would typically conform to AS 1554 General Purpose and American Bureau of Shipping (ABS) or equivalent, to achieve safe and effective welding outcomes.

This unit applies to all types of welding and includes the identification of properties and characteristics of all commonly used metals, and selection of appropriate welding techniques to ensure integrity of materials is maintained during welding processes.

This unit can only be selected in conjunction with one or more of the following units:

- MEM05015 Weld using manual metal arc welding process
- MEM05017 Weld using gas metal arc welding process
- MEM05019 Weld using gas tungsten arc welding process
- MEM05023 Weld using submerged arc welding process
- MEM05047 Weld using flux core arc welding process
- MEM05055 Weld using oxy fuel gas welding process

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify properties of commonly used metals**	2.1	Identify materials to be welded
		2.2	Identify characteristics and properties of commonly used materials
		2.3	Identify uses and purposes of commonly used materials
		2.4	Consider basic metallurgical characteristics
3	**Identify and provide for welding contingencies**	3.1	Source Information relevant to welding processes, as required
		3.2	Identify potential contingencies and consider solutions
4	**Identify appropriate welding process**	4.1	Identify and select welding processes to achieve specified outcomes with selected metals
		4.2	Identify effects of welding processes on materials
		4.3	Identify distortion prevention measures
		4.4	Identify alternative joining methods for job and assess for relevancy

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Identify cleaning and preparation requirements**	5.1 Identify processes for cleaning and preparing metals
	5.2 Consider role of contaminants in welding flaws
	5.3 Identify and utilise safety requirements for chemicals and other materials in accordance with manufacturers' specifications and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Characteristics include the following:	• tensile strength, grade, heat resistance and density
Properties include the following:	• physical properties, flammable limits and melting point
Basic metallurgical characteristics include the following:	• alloys and grades of metals and different types of electrodes
Information includes one (1) or more of the following:	• steel suppliers’ handbooks • welding company materials • SOPs • safety documentation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welding processes include one (1) or more of the following:	• fusion – electric arc welding, gas (oxy-fuel) welding and thermit welding • pressure welding processes – resistance welding, fire or forge welding, friction welding and explosive welding • low temperature processes – soldering and brazing • other – ultrasonic welding and electron beam welding
Effects include one (1) or more of the following:	• thermal expansion • heat affected zones • fume emissions • altered density • distortion
Distortion prevention measures include one (1) or more of the following:	• heat treatments • consolidations
Processes for cleaning and weld preparation include one (1) or more of the following:	• etching • grinding • arc gouging • thermal cutting • chemical additives • anti-corrosion treatments
Safety requirements include one (1) or more of the following:	• dry and ventilated areas • in accordance with workplace procedures • location away from heat risks • location away from incompatible substances • requirements for hazardous substances • adequate signage and labelling • appropriate sealing • routine inspections • emergency procedures • regulatory notification requirements

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05051 Select welding processes (Release 1).

Release 1. Supersedes and is equivalent to MEM05051A Select welding processes.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05051 Select welding processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05051 Select welding processes (Release 1).

Release 1. Supersedes and is equivalent to MEM05051A Select welding processes.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying properties of common used metals
- identifying potential contingencies and considering solutions
- identifying and selecting appropriate welding process and the effects of the welding process on materials
- identifying processes for cleaning and preparing metals and the role of contaminants in welding flaws.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- properties and characteristics of commonly used metals and materials
- basic metallurgy principles associated with alloys and grades of metals
- uses and purposes of various metals
- distortion prevention measures for various metals
- different types of electrodes
- hazards associated with the use of chemicals and the fumes emitted by welding processes.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting welding processes at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05052 Apply safe welding practices

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05052 Apply safe welding practices (Release 1).

Release 1. Supersedes and is equivalent to MEM05052A Apply safe welding practices.

Application

This unit of competency defines the skills and knowledge required to identify risks associated with welding operations that would typically conform to AS 1554 General Purpose and American Bureau of Shipping (ABS) or equivalent on all commonly used metals and the implementation of techniques used to reduce or eliminate welding hazards.

This unit can only be selected in conjunction with one or more of the following units:

- MEM05015 Weld using manual metal arc welding process
- MEM05017 Weld using gas metal arc welding process
- MEM05019 Weld using gas tungsten arc welding process
- MEM05023 Weld using submerged arc welding process
- MEM05047 Weld using flux core arc welding process
- MEM05055 Weld using oxy fuel gas welding process

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fabrication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify risks associated with welding**	2.1	Obtain and interpret work-related safety information
		2.2	Identify pollutants formed by welding processes
		2.3	Identify occupational diseases and injuries that are associated with welding
		2.4	Identify factors associated with increased risk
		2.5	Identify exposure levels for pollutants
		2.6	Identify risks and potential health effects associated with specific metals and gases in welding
		2.7	Identify other hazards of welding
3	**Reduce risks associated with welding**	3.1	Use manual handling techniques
		3.2	Implement procedures to control hazards and workplace safety procedures
		3.3	Report workplace safety non-compliances in accordance with workplace procedures

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

WHS information includes one (1) or more of the following:	• Safe Work Australia guidelines • organisational WHS practices and procedures manuals • Australian/New Zealand and ISO standards • company risk management policy • codes of practice • Australian dangerous goods legislation • trade practices • WHS reporting requirements • weld procedures
Work-related safety information includes one (1) or more of the following:	• SOPs • safety data sheets (SDSs) • job sheets • emergency procedures • safety standards and procedures
Pollutants include one (1) or more of the following:	• nitrogen oxides • ozone • metal fumes • lead oxide • silicon oxide • calcium fluoride • calcium oxide • magnesium oxide • sodium oxide • potassium oxides • carbon dioxide

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- organics
- iron
- manganese
- calcium carbonate
- zirconium oxide
- titanium oxide
- hexavalent chromium

Occupational diseases and injuries include one (1) or more of the following:

- eye injuries
- skin damage
- respiratory irritations
- chronic effects
- allergies

Factors include one (1) or more of the following:

- gas leakage from cylinders
- type of consumable and metals used
- type of welding processes
- type of electrodes
- welding current
- voltage and amperage
- ventilation
- contamination
- interaction of chemicals
- exposure levels
- flammability

Exposure levels include one (1) or more of the following:

- time weighted average
- short term exposure limit (STEL)
- maximum allowable concentration (MAC) or threshold limit value - ceiling (TLV-C)
- skin notation

Specific metals include one (1) or more of the following:

- aluminium
- antimony
- arsenic

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- beryllium
- boron
- cadmium
- chromium
- copper
- cobalt
- iron
- lead
- lithium
- magnesium
- manganese
- mercury
- molybdenum
- nickel
- platinum
- selenium
- silver
- thorium
- tin
- titanium
- tungsten
- vanadium
- zinc
- zirconium

Gases include one (1) or more of the following:

- acetylene
- argon
- carbon dioxide
- carbon monoxide
- helium
- nitrogen oxides
- ozone
- phosgene
- phosphine
- stibine

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Other hazards include one (1) or more of the following:

- fluxes
- electro-magnetic radiation
- electric shock
- sparks
- spatter
- contaminated and coated metals
- gas cylinder and electrical hazards
- confined spaces
- noise
- chemical exposure
- solvents
- musculoskeletal, back and overuse injuries
- vibration
- dusts
- heat stress
- ultraviolet radiation
- airborne pollutants
- flammable gases
- infrared radiation
- thermal damage

Manual handling techniques include one (1) or more of the following:

- housekeeping practices
- lifting weight limits
- appropriate storage
- use of lifting devices
- appropriate training
- hazardous materials storage standards and procedures

PPE includes one (1) or more of the following:

- respirators
- ear muffs
- protective clothing
- gloves
- boots
- helmets
- eye protection
- face shields

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Procedures to control hazards include one (1) or more of the following:	• substituting hazardous materials with safer materials • changing workplace design to eliminate hazards • modifying work practices to reduce exposure • using PPE • using adequate and appropriate ventilation
Workplace safety measures include one (1) or more of the following:	• shielding requirements • ventilation • general and diluted • local exhaustion • use of PPE • checking equipment condition • equipment maintenance • correct operation of equipment • correct voltage and electrical connections • good posture • fire safety, plant and equipment isolation • communications with appropriate personnel

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05052 Apply safe welding practices (Release 1).

Release 1. Supersedes and is equivalent to MEM05052A Apply safe welding practices.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05052 Apply safe welding practices

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05052 Apply safe welding practices (Release 1).

Release 1. Supersedes and is equivalent to MEM05052A Apply safe welding practices.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting work health and safety (WHS) information and legislation
- identifying risks and hazards associated with welding
- implementing risk control measures and procedures, including using appropriate manual handling techniques and personal protective equipment (PPE)
- reporting workplace non-compliances in accordance with workplace procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of PPE
- characteristics and properties of common metals and welding materials
- effect of gas and electrical welding operations on metals
- effect of various treatments on a range of commonly used metals
- WHS information and sources
- work-related safety information
- pollutants present as a result of welding activities
- all the welding processes, including equipment and material requirements
- hazards associated with welding processes and methods to minimise those hazards.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying safe welding practices at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05053 Set and edit computer controlled thermal cutting machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05053 Set and edit computer controlled thermal cutting machines (Release 1).

Release 1. Supersedes and is equivalent to MEM05053A Set and edit computer controlled thermal cutting machines.

Application

The unit of competency defines the skills and knowledge required to set up and edit any computer or numerically controlled thermal cutting machine or process and applications, including NC/CNC thermal cutting machines and industrial robots performing thermal cutting.

Where manual heating and thermal cutting is required, unit MEM05007 Perform manual heating and thermal cutting should also be selected.

Where advanced manual thermal cutting, gouging and shaping is required unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

Where setting and editing other computer controlled machines is required unit MEM07016 Set and edit computer controlled machines and processes should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: 4

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Pre-requisite Unit

MEM05009	Perform automated thermal cutting
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Set work holding fixtures/devices/tools and gas and nozzle controls**	2.1	Select correct ancillary devices and attach to machine using SOPs
		2.2	Prepare machine to accept work holding devices
		2.3	Set work holding fixtures/devices/tools to zero or a datum using appropriate setting devices

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.4	Set gas and nozzle controls according to type and thickness of material to be cut and to minimise distortion
3 **Trial program**	3.1	Trial program observing all safety procedures
	3.2	Check sample cut for compliance with specifications
	3.3	Edit program to ensure job conforms to specification
4 **Complete setting process**	4.1	Replace worn or damaged nozzles, regulators and work holding devices/tools, where appropriate, or take other corrective action in accordance with SOPs
	4.2	Instruct operator, if necessary, ensuring that all safety procedures and devices are in place

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Program editing includes the following:	• identifying and accessing program in edit mode in situ in order to make changes associated with: • gas mixtures • nozzle or work piece feed speed • operational sequence

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05053 Set and edit computer controlled thermal cutting machines (Release 1).

Release 1. Supersedes and is equivalent to MEM05053A Set and edit computer controlled thermal cutting machines.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05053 Set and edit computer controlled thermal cutting machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05053 Set and edit computer controlled thermal cutting machines (Release 1).

Release 1. Supersedes and is equivalent to MEM05053A Set and edit computer controlled thermal cutting machines.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing thermal cutting machine for work according to the thickness of material and minimisation of distortion
- trialling program by checking sample cut for compliance and undertaking program editing to ensure job conforms with specifications
- instructing operator, if necessary, including ensuring all safety procedures and devices are in place
- replacing worn or damaged nozzles, regulators, fixtures, devices and tools.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- ancillary equipment and its applications
- procedures for attaching the ancillary device(s) to the NC/CNC machine
- work holding devices, their application and procedures for mounting them
- location of work holding fixtures/devices/tools relative to the machine zero or datum
- operating procedures
- safety features and equipment
- measuring devices/ techniques for checking the parts or product
- effects of changes to gas mixtures and nozzle or work piece speed
- impact of changes to the sequence of operations on the part or product to be produced
- procedures for editing programs via the machine controller
- sequence of operations of the machine/process
- corrective action to be taken for worn or damaged tooling.

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Assessment Conditions

- Assessors must:
  - have vocational competency in setting and editing computer controlled thermal cutting machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05054 Write basic NC/CNC programs for thermal cutting machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05054 Write basic NC/CNC programs for thermal cutting machines (Release 1).

Release 1. Supersedes and is equivalent to MEM05054A Write basic NC/CNC programs for thermal cutting machines.

Application

This unit of competency defines the skills and knowledge required to identify computer controlled machine program elements, write a basic program and operation sheet, and trial the program for thermal cutting machines.

This unit extends to writing a program to describe simple thermal cutting machine operations, including cutting paths, using appropriate software for machines which incorporates single or multiple nozzles and material loaders.

Where basic programming of other computer controlled machines is required unit MEM07018 Write basic NC and CNC programs should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM05007	Perform manual heating and thermal cutting
MEM05008	Perform advanced manual thermal cutting, gouging and shaping
MEM05009	Perform automated thermal cutting

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MEM05053	Set and edit computer controlled thermal cutting machines
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Write basic NC/CNC machine program**	2.1	Select appropriate program elements for machine controller
		2.2	Interpret engineering drawings to define basic machine function and cutting path geometry
		2.3	Calculate co-ordinates for cutting path
		2.4	Write program in standard code format in accordance with procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Write NC/CNC operation sheet and trial program**	3.1 Produce operation sheets to specification in accordance with SOPs
	3.2 Operate machine in manual mode to test and prove program
	3.3 Edit program if necessary to adjust operation
	3.4 Check components for compliance to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Basic machine programming includes:	• NC/CNC thermal cutting machines which do not require programming using canned cycles and sub-routines
Standard code format includes:	• common M and G codes

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05054 Write basic NC/CNC programs for thermal cutting machines (Release 1).

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Release 1. Supersedes and is equivalent to MEM05054A Write basic NC/CNC programs for thermal cutting machines.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05054 Write basic NC/CNC programs for thermal cutting machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05054 Write basic NC/CNC programs for thermal cutting machines (Release 1).

Release 1. Supersedes and is equivalent to MEM05054A Write basic NC/CNC programs for thermal cutting machines.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting basic NC/CNC thermal cutting machines controller elements which do not require programming using canned cycles and sub-routines
- writing program in standard code format by interpreting drawings to define basic machine function and cutting path geometry and calculating co-ordinates for cutting path and producing operation sheets to specifications
- trialling and editing program by operating machine in manual mode to test and proving program and adjusting operation as required
- checking components for compliance against specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- elements of a basic NC/CNC program
- function of elements in controlling the operation of an NC/CNC machine
- types of NC/CNC thermal cutting and welding machines and their applications
- thermal cutting operations controlled by program
- cutting paths to be followed when cutting a part or product and the reasons for selecting cutting paths and sequence of operations
- zero point of the NC/CNC machine
- standard codes, applications and procedures used in the writing of NC/CNC programs
- procedures and information to be included for completing NC/CNC operation sheets
- procedures for manual operation of the NC/CNC machine and reasons for testing and proving the NC/CNC program

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- procedures for editing the NC/CNC program via the machine controller
- Effects of editing on the operation of the NC/CNC machine and the part or product to be cut
- measuring equipment/techniques used to check for conformance to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in writing basic NC/CNC programs for thermal cutting machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05055 Weld using oxy fuel gas welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05055 Weld using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Application

This unit has been primarily developed for Engineering Tradesperson - Fabrication apprenticeship training and the recognition of trade-level skills in oxy fuel gas welding on heavy or light metal fabrications. It may also apply to other trade occupations requiring higher level oxy fuel gas welding skills.

Weld quality would typically conform to AS 1554 General Purpose and American Bureau of Shipping (ABS) or equivalent.

Where manual thermal processes associated with preparation, pre-heat and/or post-heat is required unit MEM05007 Perform manual heating and thermal cutting and unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM05004	Perform routine oxy fuel gas welding
MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for oxy fuel gas welding oxy fuel gas**	2.1	Prepare materials to achieve the required weld requirements
		2.2	Assemble/align materials to specification, where required
3	**Select, assemble and set up**	3.1	Identify and select welding equipment and consumables appropriate to job requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	welding equipment and consumables	3.2	Assemble welding equipment and set up in accordance with SOPs
4	**Minimise and rectify distortion**	4.1	Apply appropriate distortion prevention measures
		4.2	Rectify any distortion using appropriate techniques
5	**Weld to job specification using oxy fuel gas**	5.1	Ensure weld deposit is to specifications
		5.2	Clean joints to specifications
6	**Ensure weld conformance**	6.1	Inspect weld joints visually for conformance to specifications
		6.2	Rectify any weld defects with minimum loss of sound metal using correct techniques and tools
		6.3	Complete weld records, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the	• fillet • butt

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:

Weld positions include the following:

- horizontal
- vertical
- overhead

Materials include one (1) or more of the following:

- ferrous materials
- non-ferrous metals
- alloys suitable for oxy fuel gas welding

Preparation of materials includes one (1) or more of the following:

- pre-heating
- setting up of jigs
- fixtures and clamps
- joint preparation (e.g. bevelling)

Distortion prevention measures include one (1) or more of the following:

- pre-heating
- setting up:
  - jigs
  - fixtures
  - clamps

Equipment includes the following:

- gas cylinders
- hoses
- blowpipes
- tips and nozzles
- regulators
- flashback arrestors

Defects include one (1) or more of the following:

- porosity
- slag inclusions
- discontinuities
- lack of penetration
- undercut

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05055 Weld using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05055 Weld using oxy fuel gas welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05055 Weld using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for oxy fuel gas to AS 1554 General Purpose or equivalent
- selecting appropriate weld and joint preparation methods
- setting up:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- weld materials to AS 1554 General Purpose or equivalent using oxy fuel gas welding equipment while preventing distortion
- rectifying any defects
- completing weld records related to oxy fuel gas onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- purpose of and setting up requirements of:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators

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  - flashback arrestors
- material preparation for oxy fuel gas welding
- weld joint preparations
- filler rod materials
- causes of distortion for materials when welded
- causes of weld defects and methods of rectification
- standards for oxy fuel gas welding, including AS 1554 General Purpose or equivalent.

Assessment Conditions

- Assessors must:
  - have vocational competency in oxy fuel gas welding at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM05056 Perform routine flux core arc welding

Modification History

Release 1. New unit

Application

This unit of competency defines the skills and knowledge required to prepare the materials and carry out routine flux core arc welding (FCAW) and applies in a maintenance or manufacturing environment where the weld quality is not required to meet an Australian Standard.

Where welding is required to meet AS 1554 General Purpose or equivalent codes, work health and safety (WHS) regulations and/or licensing requirements unit MEM05047 Weld using flux core arc welding process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials and equipment for welding**	2.1	Identify location of welds in accordance with procedures and job specifications
		2.2	Clean and prepare materials ready for welding
		2.3	Set up welding equipment to meet work requirement
		2.4	Select settings and consumables to suit application
3	**Perform routine welding using FCAW**	3.1	Weld materials to job requirements
		3.2	Clean welds according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• butt • fillet
Materials include one (1) or more of the following:	• low carbon • mild steels

Prepared includes one (1) or more of the following:	• pre-heating
	• setting up:
	  • jigs
	  • fixtures
	  • clamps
	• joint preparation

Welding equipment includes the following:	• hoses • welding leads • electrodes/filler wire • liners • contact tips
Consumables include the following:	• filler wire • shielding gas for dual shield applications
Clean includes the following:	• slag • spatter

Unit Mapping Information

No equivalent unit.

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Links

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Assessment Requirements for MEM05056 Perform routine flux core arc welding

Modification History

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from sketches and verbal or written job instructions for performing routine flux core arc welding (FCAW)
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including selecting settings and consumables to suit application
- consistently welding materials to specifications
- cleaning welds in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- preparatory requirements
- equipment and equipment settings
- shielding gas properties and applications
- weld characteristics.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine FCAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05057 Perform routine submerged arc welding

Modification History

Release 1. New unit

Application

This unit of competency defines the skills and knowledge required to prepare the materials and carry out routine submerged arc welding (SAW) and applies in a maintenance or manufacturing environment where the weld quality is not required to meet an Australian Standard.

Where welding is required to meet AS 1554 General Purpose or equivalent codes, work health and safety (WHS) regulations and/or licensing requirements Unit MEM05023 Weld using submerged arc welding process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Prepare materials and equipment for welding**	2.1	Identify location of welds in accordance with procedures and job specifications
		2.2	Clean and prepare materials ready for welding
		2.3	Set up welding equipment to meet work requirement
		2.4	Select settings and consumables to suit application
3	**Perform routine welding using SAW**	3.1	Weld materials to job requirements
		3.2	Clean welds according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Welds include the following:	• butt • fillet
Materials include one (1) or more of the following:	• low carbon • mild steels

Preparation includes one (1) or more of the following:	• preheating
	• setting up:
	  • jigs
	  • fixtures
	  • clamps
	• joint preparation

Welding equipment includes the following:	• welding head • electrodes/filler wire • flux hopper
Consumables include the following:	• filler wire • flux
Clean includes the following:	• slag • spatter

Unit Mapping Information

No equivalent unit.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05057 Perform routine submerged arc welding

Modification History

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from sketches and verbal or written job instructions for performing routine submerged arc welding (SAW)
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including selecting settings and consumables to suit application
- consistently welding materials to specifications
- cleaning welds in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- preparatory requirements
- equipment and equipment settings
- flux properties and applications
- weld characteristics.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine SAW process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM05058 Perform welds to code standards using oxy fuel gas welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05058 Perform welds to code standards using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Application

This unit of competency defines the skills and knowledge required to prepare and produce welds to code standards using oxy fuel gas welding on a range of materials.

Butt and fillet welds in the flat, horizontal, vertical and overhead positions would be applied to meet AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent. This unit, together with Unit MEM05026 Apply welding principles, may satisfy the requirements AS 1796-2001 (R2016) Certification of welders and welding supervisors, Certificate 6.

Where advanced manual thermal cutting, gouging and shaping is required Unit MEM05008 Perform advanced manual thermal cutting, gouging and shaping should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM05004	Perform routine oxy fuel gas welding
MEM05007	Perform manual heating and thermal cutting
MEM05022	Perform advanced welding using oxy acetylene welding process
MEM05026	Apply welding principles
MEM05051	Select welding processes

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MEM05052	Apply safe welding practices
MEM05055	Weld using oxy fuel gas welding process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Fabrication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare welding**	2.1	Prepare materials to produce weld to code standard

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
	materials and equipment for GW welding to code standard	2.2 Perform routine maintenance on welding equipment
		2.3 Set up welding equipment
3	**Weld joints using GW to procedure specifications**	3.1 Weld materials in accordance with weld procedure specification
		3.2 Rectify discontinuities to ensure compliance to code requirements
		3.3 Maintain weld records according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:

- ensuring oxy fuel gas welding equipment is in good condition

Equipment includes the following:

- gas cylinders
- hoses
- blowpipes
- tips and nozzles
- regulators
- flashback arrestors

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Preparation includes one (1) or more of the following:	• joint preparation:
	  • flame cut and ground
	  • machined
	• preheating
	• setting up:
	  • jigs
	  • fixtures
	  • clamps

Materials include one (1) or more of the following:	• carbon/manganese steel • stainless steel • low alloy steel

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM05058 Perform welds to code standards using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM05058 Perform welds to code standards using oxy fuel gas welding process

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM05058 Perform welds to code standards using oxy fuel gas welding process (Release 1).

Release 1. New unit.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications from drawings, sketches and verbal or written job instructions for performing welds using oxy fuel gas welding to code standards
- cleaning and preparing materials for welding to specifications
- setting up welding equipment, including performing routine maintenance
- consistently weld materials to specifications
- rectifying any discontinuities
- completing and maintaining weld records related to oxy fuel gas welding to code standards onto standard workplace forms.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe welding practices and procedures and use of personal protective equipment (PPE)
- requirements to produce welds to quality of AS 1210-2010 Pressure vessels, AS 4041-2006 (R2016) Pressure piping, and American Society of Mechanical Engineers (ASME) IX or equivalent
- relevant standards or codes
- purpose of and setting up requirements of:
  - gas cylinders
  - hoses
  - blowpipes
  - tips and nozzles
  - regulators
  - flashback arrestors
- methods for preparing plate for code standard welding

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- causes of weld defects and methods of rectification
- pre-welding and post-welding heating methods and requirements for plate welding to code standard
- requirements for maintaining weld records to code standard.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing welds to code standards using oxy fuel gas welding process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM06001 Perform hand forging

Modification History

Release 1. Supersedes and is equivalent to MEM06001B Perform hand forging

Application

This unit of competency defines the skills and knowledge required to use hand tools and formers, apply hand forging techniques and operate heat treatment equipment.

Where simple manual heating and bending is required unit MEM05007 Perform manual heating and thermal cutting should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawings should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Apply hand forging techniques**	2.1	Select and use hand tools and formers for specific forging techniques
		2.2	Select and apply appropriate hand forging technique to produce articles to specification
		2.3	Adhere to forging temperatures and heat specifications for various materials
		2.4	Make allowance for material shrinkage and oxidisation
3	**Operate heating equipment**	3.1	Set up and correctly operate the appropriate heating equipment, required for the job
		3.2	Operate equipment in a manner that minimises oxidisation
		3.3	Control heat to specified areas

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Hand tools and formers include one (1) or more of the following:	• flatters • set hammers • hot/cold sets • ball peen hammer • swages
Hand forging techniques include one (1) or more of the following:	• drawing • swaging • bending • upsetting • spreading • punching • drifting
Materials include one (1) or more of the following:	• low to medium carbon steels • low to medium alloy steels
Heating equipment includes one (1) or more of the following:	• diesel • electric and gas furnaces • coke fires • gaseous oxygen/fuel equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06001B Perform hand forging

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM06001 Perform hand forging

Modification History

Release 1. Supersedes and is equivalent to MEM06001B Perform hand forging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and using hand tools and formers
- selecting and applying hand forging techniques
- determining correct forging temperatures
- operating heat treatment equipment safely and effectively to hand forge materials to specification.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- features and use of the range of hand tools, formers used in hand forging
- hand forging techniques, including drawing, swaging, bending, upsetting, spreading, punching and drifting
- calculations used to determine mean diameter, length and circumference
- sources of information on forging temperatures
- heat specifications for various materials
- effects of and allowances for material shrinkage and oxidisation
- application, set up and means of adjustment of diesel, electric and gas furnaces; coke fires and gaseous oxygen/fuel heating equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing hand forging at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM06002 Perform hammer forging

Modification History

Release 1. Supersedes and is equivalent to MEM06002B Perform hammer forging

Application

This unit of competency defines the skills and knowledge required to use hammer and power hammer tools and formers, apply hammer forging techniques and operate heating devices.

Equipment used does not include drop and upset machinery, vacuum furnaces or rolling and extruding mill machinery.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select material**	2.1	Select material for use with specific tools and formers
		2.2	Make material calculations using volumes and weights that include provision for thermal expansion/contraction, oxidisation and shrinkage
3	**Use hammer tools and formers**	3.1	Select and use hammer tools and formers for specific forging techniques
		3.2	Set up and operate forging machine
4	**Apply hammer forging techniques**	4.1	Select and apply appropriate hammer forging technique
		4.2	Recognised defects and take appropriate action for rectification
		4.3	Apply correct techniques to the handling of hot metal with regard to balancing and pivoting
		4.4	Apply the correct heating process

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• low/high carbon steels • alloys • stainless steel • lead
Material calculations include one (1) or more of the following:	• thermal expansion/contraction • material wastage
Hammer tools and formers include one (1) or more of the following:	• flatters • set hammers • hot/cold sets • ball peen hammer • swages
Defects include one (1) or more of the following:	• galls • fins • shrinkage • oxidisation
Heating process includes one (1) or more of the following:	• diesel • electric and gas furnaces • coke fires • gaseous oxygen/fuel equipment

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06002B Perform hammer forging

Links

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Assessment Requirements for MEM06002 Perform hammer forging

Modification History

Release 1. Supersedes and is equivalent to MEM06002B Perform hammer forging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- calculating material requirements for hammer forging allowing for thermal expansion and wastage
- selecting and using hammer tools and formers
- setting up and operating forging machines
- using hammer forging techniques to forge material to specification
- detecting forging defects and rectifying forging techniques
- operating heating equipment and safely handling hot metal.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- hammer forging techniques
- set up and operation of forging machines
- safe techniques for handling hot metal
- oxidisation/shrinkage allowances for forging material
- calculations and formulae for determining the volume and weight of material
- forging material specifications

Assessment Conditions

- Assessors must:
  - have vocational competency in performing hammer forging at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM06003 Carry out heat treatment

Modification History

Release 1. Supersedes and is equivalent to MEM06003C Carry out heat treatment

Application

This unit of competency defines the skills and knowledge required to carry out heat treatment using a variety of equipment for cast metal products, machine tooling, and forged and machined components.

Where simple heat treatment applications like annealing and/or heat/quench processes undertaken as incidental to trade work (e.g. toolmaking) is required unit MEM06007 Perform basic incidental heat/quenching, tempering and annealing should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or verbal instructions from metallurgist or supervisor
2	**Select and set up heat treatment equipment**	2.1	Select appropriate equipment for the required heat treatment
		2.2	Set up equipment according to SOPs and manufacturers' instructions
3	**Work safely with hot metals**	3.1	Demonstrate emergency procedures according to approved safety instructions and identity and follow safety signs
		3.2	Use equipment according to specifications and SOPs
4	**Heat treat material**	4.1	Treat material to achieve required result, which may include preparation processes
		4.2	Piece or batch load and unload material using equipment according to SOPs
		4.3	Maintain correct temperature according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• gas • electric • oil fired furnaces • vacuum furnace • induction heating • kilns • heated baths • salt baths • specialised tongs/tools • lifting equipment
Materials include one (1) or more of the following:	• carbon steels • alloy steels • non-ferrous
Preparation processes include one (1) or more of the following:	• coatings and packings • preheating • soaking • quenching • tempering • annealing • normalising • carburizing • sintering

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06003C Carry out heat treatment

Links

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Assessment Requirements for MEM06003 Carry out heat treatment

Modification History

Release 1. Supersedes and is equivalent to MEM06003C Carry out heat treatment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing required heat treatment appropriate materials
- selecting, setting up and safely using appropriate equipment for heat treatment processes
- undertaking necessary preparation process and heat treating material to specifications working safely with hot metals at all times.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- heat treatment work specifications
- treatment material features and characteristics
- heat treatment applications, equipment and processes
- emergency procedures
- material preparation, quenching, preheating requirements
- material condition during heat treating process
- safe loading and batch and/or piece loading of furnaces.

Assessment Conditions

- Assessors must:
  - have vocational competency in carrying out heat treatment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring State as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM06004 Select heat treatment processes and test finished product

Modification History

Release 1. Supersedes and is equivalent to MEM06004B Select heat treatment processes and test finished product

Application

This unit of competency defines the skills and knowledge required to select the appropriate process to achieve the desired result, record and maintain heat treatment information, and test treated materials.

Equipment used does not include drop and upset machinery, vacuum furnaces or rolling and extruding mill machinery.

Where destructive and/or non-destructive testing is required units defining the appropriate skills and knowledge should also be selected.

Where heat treatment is required appropriate heat treatment units should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and tools are required, unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

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Pre-requisite Unit

MEM06003	Carry out heat treatment
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select heat treatment process**	2.1	Determine appropriate heating processes and equipment suited to the metal composition and the effects of heat and cooling on that metal composition
		2.2	Determine heat treatment process to achieve specified result using reference material, metallurgist's report, and consultation with technical specialists or other appropriate personnel
		2.3	Enter selection into production documentation
3	**Test material**	3.1	Prepare material for testing, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.2 Carry out destructive and/or non-destructive testing of material properties using appropriate testing equipment
	3.3 Identify any heat treatment faults and report, if appropriate
	3.4 Rectify heat treatment faults, where possible
	3.5 Record and maintain information relating to equipment, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Heat treatment processes include one (1) or more of the following:	• coatings and packings • preheating • soaking • quenching • tempering • annealing • normalising • carburising • sintering
Metal composition includes one (1) or more of the following:	• high/low carbon steel • ferrous/non-ferrous

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• salt baths • vacuum furnace • induction heating • kilns • gas fired furnaces
Materials include one (1) or more of the following:	• ferrous metals • non-ferrous metals
Testing includes the following:	• destructive methods • non-destructive methods
Heat treatment faults include one (1) or more of the following:	• thermal fractures • distortion • shrinkage • oxidisation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06004B Select heat treatment processes and test finished product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM06004 Select heat treatment processes and test finished product

Modification History

Release 1. Supersedes and is equivalent to MEM06004B Select heat treatment processes and test finished product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, reports and other applicable reference documents in selecting heat treatment process and testing of finished product
- determining the heat treatment process to achieve the desired result for the composition of the material
- identifying and rectifying heat treatment faults
- testing the treated material using destructive and non-destructive testing methods
- maintaining heat treatment and testing work documentation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- treatment material features and characteristics
- heat treatment processes and effects of heat on material characteristics
- material preparation including quenching, preheating, temperature requirements for different materials and processes
- types of destructive and non-destructive testing and their use
- heat treatment faults and corrections.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting heat treatment processes and testing finished product at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM06005 Perform drop and upset forging

Modification History

Release 1. Supersedes and is equivalent to MEM06005B Perform drop and upset forging

Application

This unit of competency defines the skills and knowledge required to select, set up and operate drop and upset forging equipment where material is forged to specified dimensional accuracy and finish.

Where routine, repetitive cold upset forging is required unit MEM07024 Operate and monitor machine and process should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM06002	Perform hammer forging
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Identify and select drop and upset forging equipment and tools for specific operation**	2.1	Select appropriate equipment suitable for the size of material and forging procedures
		2.2	Select dies and punches for specific operations and equipment
		2.3	Determine die replacement with regard to relief allowances, cracking and dimensions
3	**Set up and operate drop and upset forging equipment**	3.1	Set up equipment, adjust and operate
		3.2	Apply correct die setting techniques in setting appropriate die and punch alignment
		3.3	Apply correct die preheating procedures
4	**Prepare material**	4.1	Prepare materials and heat in accordance with job requirements and/or specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Drop and upset forge material**	5.1 Calculate material amounts with allowance for heat wastage and flash or fin
	5.2 Drop forge material using the correct procedures and techniques
	5.3 Apply correct lubricant for die wear and forging release
	5.4 Determine correct grain flow
	5.5 Identify and correct galls, folds and cracks
	5.6 Carry out removal of flash or fin in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• drop forging hammer/press • open die forging hammer using closed loose die or horizontal upsetting machine (heading machine)
Materials include one (1) or more of the following:	• ferrous materials (steel) • non-ferrous material (copper and aluminium bronze)
Lubricants include one (1) or more of the following:	• graphite bearing oils/greases • cellulose granules • waxes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Correct removal includes one (1) or more of the following:	• ejector pins • drafts in die (angle)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06005B Perform drop and upset forging

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM06005 Perform drop and upset forging

Modification History

Release 1. Supersedes and is equivalent to MEM06005B Perform drop and upset forging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- setting up and using a range of drop forging and upset (and cold upset) forging equipment
- performing preparation and forging of materials using drop and upset methods, including using lubricants for forged material release
- performing material finishing and correction of forging galls, folds and cracks as necessary.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- drop or upset forging techniques
- characteristics of forging equipment
- reasons and remedies for incorrect/correct alignment of dies and punches
- preparation of dies (pre-heating, preparation, lubrication, defects, conformance and replacement)
- techniques for materials pre-heating
- relevant forging tools, techniques and equipment
- techniques for setting, adjusting and operating forging equipment
- features of defects in drop/upset forged articles, including galls, folds, cracks and ways of correcting defects and removing flash, fins from drop/upset forged articles
- calculations for material volume, weight, allowances, heat wastage and flash/fin.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing drop and upset forging at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM06006 Repair springs

Modification History

Release 1. Supersedes and is equivalent to MEM06006C Repair springs

Application

This unit of competency defines the skills and knowledge required to assess spring condition, set and reset springs for repair, set up and operate spring forming equipment, form and shape material and test components.

Equipment use does not include automated spring making equipment.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM06001	Perform hand forging
MEM06003	Carry out heat treatment
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Assess spring condition**	2.1	Check springs for correct operation and identify defects in accordance with SOPs
		2.2	Identify springs suitable for rework and the appropriate repair procedure
3	**Set and reset springs for repair**	3.1	Apply correct stripping procedure
		3.2	Allow for setting tolerances in set/reset of springs to specification
		3.3	Control correct temperature for setting/resetting springs
4	**Set up and operate spring forming equipment**	4.1	Set up and use equipment in accordance with procedures
		4.2	Position spring material and safety guards
		4.3	Select forming equipment and tools for given application

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Form and shape material**	5.1 Determine material lengths
	5.2 Taper, roll and bend material to conform to specifications
	5.3 Adopt correct procedure for hot and cold forming
	5.4 Make allowance for relief and spring-back
6 **Test components**	6.1 Determine spring compression from specifications
	6.2 Determine any defects and confirm dimensional accuracy
	6.3 Re-set non-conforming springs and adjust spring forming equipment as necessary
	6.4 Nest springs to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Springs include one (1) or more of the following:	• laminated • compression/coil • plate
Equipment includes one (1) or more of the	• tapering • coiling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

following:	• stripping and buckling • spring testing machines
Material includes one (1) or more of the following:	• spring • specialised steel

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06006C Repair springs

Links

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Assessment Requirements for MEM06006 Repair springs

Modification History

Release 1. Supersedes and is equivalent to MEM06006C Repair springs

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least (2) two occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing spring condition and selecting suitable set and reset repair methods
- setting up and operating spring forming equipment and tools to form and shape spring material
- testing spring components and adjusting, as necessary, to meet specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures to test springs for correct operation/malfunction
- causes of deviations from specifications and/or defects in springs
- effects of annealing, hardening, tempering, soaking and setting on spring operation
- repair and rework procedures for a range of spring defects
- procedures for tapering, rolling and bending materials
- features and application of hot and cold forming processes
- allowances to be made for relief and spring-back
- procedures for recording spring test results
- procedures for nesting springs.

Assessment Conditions

- Assessors must:
  - have vocational competency in repairing springs at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM06007 Perform basic incidental heat/quenching, tempering and annealing

Modification History

Release 1. Supersedes and is equivalent to MEM06007B Perform basic incidental heat/quenching, tempering and annealing

Application

This unit of competency defines the skills and knowledge required to perform straightforward heating/quenching, tempering and annealing materials to specifications.

Work would normally be one-off processes or processes incidental to trade work (e.g. toolmaking and metal spinning).

Where more comprehensive or complex heating treatment is required unit MEM06003 Carry out heat treatment and MEM06004 Select heat treatment processes and test finished product, should also be selected as appropriate.

Where continuous or batch heat treatment of materials is required unit MEM07024 Operate and monitor machine and process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Set up equipment for heat/quenching, tempering and annealing**	2.1	Select appropriate heating process and/or procedure for the given job
		2.2	Set up equipment according to manufacturers' instructions and SOPs
3	**Operate heating equipment**	3.1	Observe all safety procedures
		3.2	Follow appropriate heating equipment operating procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.3 Make appropriate equipment adjustments, as required
	3.4 Treat material to achieve required result

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Heating processes include one (1) or more of the following:	• heating/quenching • tempering • annealing
Heating equipment includes one (1) or more of the following:	• oxy acetylene • LPG gas equipment • forge
Materials include one (1) or more of the following:	• ferrous • non-ferrous metals

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06007B Perform basic incidental heat/quenching, tempering and annealing

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Links

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Assessment Requirements for MEM06007 Perform basic incidental heat/quenching, tempering and annealing

Modification History

Release 1. Supersedes and is equivalent to MEM06007B Perform basic incidental heat/quenching, tempering and annealing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, manufacturer instructions, charts, lists, sketches and other applicable reference documents to perform basic incidental heat/quenching, tempering and annealing
- setting up and operating heating equipment to treat material to achieve required result.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics and applications of heating/quenching, tempering and annealing processes
- specifications for heating/quenching, tempering and annealing
- process for heating/quenching, tempering and annealing different materials
- correct operation and adjustment of heating equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing basic incidental heat/quenching, tempering and annealing at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM06008 Hammer forge complex shapes

Modification History

Release 1. Supersedes and is equivalent to MEM06008A Hammer forge complex shapes

Application

This unit of competency defines the skills and knowledge required to forge complex shapes using a power hammer where specialised methods of holding, positioning and lifting complex forgings are required.

Where basic use of power hammer is required unit MEM06002 Perform hammer forging should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM06002	Perform hammer forging
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Set up and operate forging machine**	2.1	Set up forging machine, as required, and operate in accordance with specifications and SOPs
		2.2	Select and use complex open die tooling following safe operating procedures
3	**Forge complex shapes and heavy parts**	3.1	Position the material to be forged in the forming equipment in accordance with SOPs
		3.2	Mark and measure hot forgings, as required, making allowance for material shrinkage and oxidisation
		3.3	Use hammer tools and fixtures attached to power hammer
		3.4	Check forging to ensure conformance to tolerances and specifications
		3.5	Handle forgings in a safe and correct manner

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Heat complex forgings**	4.1 Select heating plant and equipment appropriate to work undertaken
	4.2 Apply techniques used to heat heavy and complex forgings
	4.3 Perform post-forging heating in accordance with procedures
	4.4 Apply correct techniques in handling of hot forgings

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Forge includes one (1) or more of the following:	• forging on and against cold mandrels • forging bosses • heavy rings and bushes • hammer punching and opening of large diameter holes
Equipment includes one (1) or more of the following:	• forging plant • diesel furnaces • gas furnaces

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06008A Hammer forge complex shapes

Links

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Assessment Requirements for MEM06008 Hammer forge complex shapes

Modification History

Release 1. Supersedes and is equivalent to MEM06008A Hammer forge complex shapes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and using measuring guides
- setting up and safely operating hammer forging equipment and selecting and using complex open die tooling in accordance with procedures
- using appropriate and safe methods for holding, positioning and lifting complex shaped forged material, including hot materials
- performing hammer forging of complex shapes to meet specifications
- selecting and operating heating equipment to heat treat heavy and complex forgings.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- hammer tools and formers and their application to produce a range of hammer forged articles
- hammer forging and punching techniques
- procedures for measuring forged articles and numerical operations and calculations/formulae for complex shape tooling
- effects of material shrinkage and oxidisation on the dimensions of the forged article
- methods of overcoming/allowing for the effects of shrinkage and oxidisation when hammer forging articles
- procedures for safe handling of material to be hammer forged
- forging heating equipment and applications
- heat treatment processes for forging.

Assessment Conditions

- Assessors must:

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  - have vocational competency in hammer forging of complex shapes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM06009 Hand forge complex shapes

Modification History

Release 1. Supersedes and is equivalent to MEM06009A Hand forge complex shapes

Application

This unit of competency defines the skills and knowledge required to produce intricate solid forged shapes commonly forged in the forging and fabrication areas of industry.

It covers hand forging of different metals, using specialised techniques, tools and jigs where specialised methods of holding, positioning and lifting complex forgings are required.

Where hand forging of simple shapes is required unit MEM06001 Perform hand forging should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM06001	Perform hand forging
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Forging

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Forge complex shapes using hand tools on an anvil**	2.1	Calculate material volume, making allowances for bending, material shrinkage and oxidisation, as required
		2.2	Produce complex shapes using appropriate hand tools, procedures and techniques
		2.3	Check forging to ensure conformance to tolerances and specifications
3	**Perform splitting and bundling on anvil**	3.1	Select and use appropriate tools and equipment
		3.2	Apply hand forging techniques and procedures to forging and opening bundled and split sections making allowance for material shrinkage, distortion and oxidisation
		3.3	Apply heat and control in specified areas of the material to be forged in accordance with SOPs
		3.4	Handle forgings in a safe and correct manner

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.5	Check forgings to ensure conformance to tolerances and specifications
4 **Produce jigs and tools for complex shapes**	4.1	Select tools and equipment required to taper and bend materials appropriate to task requirements
	4.2	Apply techniques for producing jigs and tools to specifications
	4.3	Bend and shape jigs and patterns to requirements
	4.4	Forge hand held tools to the cut pattern in accordance with specifications
	4.5	Perform final shaping, heat treatment and sharpening to specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Complex hand forging includes one (1) or more of the following:	• shaping • reverse tapering • jump up section for bends
Hand forging techniques include one (1) or more	• spreading • surface chasing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

of the following:	• hot splitting
Equipment includes one (1) or more of the following:	• diesel • electric and gas furnaces • coke fires • gaseous oxygen/fuel equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM06009A Hand forge complex shapes

Links

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Assessment Requirements for MEM06009 Hand forge complex shapes

Modification History

Release 1. Supersedes and is equivalent to MEM06009A Hand forge complex shapes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and using measuring guides
- calculating allowances for material volume, bending, shrinkage and oxidisation
- selecting and using hand forging tools to forge complex shapes on anvil to meet specifications
- forging open and bundled split sections safely using heating equipment, as required, to meet specifications
- producing jigs and tools for complex shapes
- performing heat treatment processes for forgings.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- forging hand tools and their applications
- techniques and procedures for hand forging complex shapes
- procedures for measuring forged articles and numerical operations and calculations/formulae for complex shapes
- forging temperatures and heat specifications for multiple pieces
- tools, techniques and equipment required to taper and bend materials
- effects of material shrinkage and oxidisation on the dimensions of the forged article
- methods of overcoming/allowing for the effects of shrinkage and oxidisation when hand forging articles
- procedures for handling forgings
- heating equipment and applications and appropriate heat treatment processes for forging different materials.

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Assessment Conditions

- Assessors must:
  - have vocational competency in hand forging complex shapes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07001 Perform operational maintenance of machines/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM07001B Perform operational maintenance of machines/equipment

Application

This unit of competency defines the skills and knowledge required to carry out programmed safety and maintenance checks on machines/equipment.

It applies in a manufacturing setting where routine programmed operational maintenance to machines/equipment is required. It is not intended to be used where higher level maintenance activities are performed.

This unit should not be selected when any of the following are selected:

- MEM07005 Perform general machining
- MEM18006 Perform precision fitting of engineering components
- MEM18055 Dismantle, replace and assemble engineering components.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Undertake programmed maintenance**	2.1	Remove/replace consumable components according to procedures
		2.2	Make adjustments to meet specifications following SOPs
		2.3	Replace and/or top up fluids and lubricants

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machines/equipment include one (1) or more of the following:	• manual • semi-automatic and automatic machines of a stand-alone, continuous production or process nature

Checks include one (1) or more of the following:	• programmed safety and maintenance checks
	• adjustments of a limited nature, including:
	  • safety guards
	  • stops
	  • wear pads and tool holders
	  • nipping up glands
	  • adjustment of scrappers and aprons

Consumable components include one (1) or more of the following:	• air filters • oil wipers • grease containers • tool tips • indicator globes • fluids and lubricants • guides • limit switch actuators

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07001B Perform operational maintenance of machines/equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07001 Perform operational maintenance of machines/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM07001B Perform operational maintenance of machines/equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying necessary maintenance requirements on a range of machines and equipment used in a manufacturing environment
- carrying out programmed maintenance to meet specifications according to SOPs
- reporting/recording on necessary routine maintenance carried out according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- programmed operational maintenance and safety check procedures for the specified machine/equipment
- recording and reporting requirements for programmed operational maintenance.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing operational maintenance of machines and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07002 Perform precision shaping/planing/slotting operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07002 Perform precision shaping/planing/slotting operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07002B Perform precision shaping/planing/slotting operations.

Application

This unit of competency defines the skills and knowledge required to perform precision shaping/planing/slotting operations.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Perform precision shaping/ planing/ slotting operations**	2.1	Determine cutting parameters
		2.2	Carry out precision operations using appropriate tools, equipment, techniques and procedures to meet specifications
3	**Check component**	3.1	Check components for compliance with specifications
		3.2	Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tools include the following:	• cutting tools • tool holders
Cutting parameters include one (1) or more of the following:	• feeds • speeds • depth of cut • length of cut
Shaping operations include one (1) or more of the following:	• precision flat surfaces • shoulders • slots • keyways • angles • dovetails
Planing operations include one (1) or more of the following:	• horizontal surfaces • vertical surfaces • angles
Slotting operations include one (1) or more of the following:	• feathered keyways • tapered keyways • slotting internal cavities • dovetails • slotting circular surfaces • internal splines

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07002 Perform precision shaping/planing/slotting operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07002B Perform precision shaping/planing/slotting operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07002 Perform precision shaping/planing/slotting operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07002 Perform precision shaping/planing/slotting operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07002B Perform precision shaping/planing/slotting operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering specifications and drawings for precision shaping, planing and slotting operations
- determining the appropriate tools, equipment and sequence of operations for a range of precision operations
- carrying out precision operations to meet specifications
- checking components for conformance to specifications and making required adjustments to cutting parameters
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting a chosen sequence of operations
- procedures for setting up the work piece
- tool type and geometry to achieve the required specifications on different materials
- shaping techniques and procedures for machining the following:
  - flat surfaces
  - shoulders
  - slots
  - keyways
  - angles
  - dovetails
- planing techniques and procedures for machining the following:

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    - horizontal and vertical surfaces
- slotting techniques and procedures for machining the following:
    - feathered keyways
    - tapered keyways
    - slotting internal cavities
    - dovetails
    - slotting circular surfaces
    - slotting internal splines
- appropriate techniques, tools and equipment to measure machined components.

Assessment Conditions

- Assessors must:
    - have vocational competency in performing precision shaping, planing and slotting operations at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07003 Perform routine machine setting

Modification History

Release 1. Supersedes and is equivalent to MEM07003B Perform machine setting (routine)

Application

This unit of competency defines the skills and knowledge required to set a range of non-numerical control (NC) and non-computer numerical control (CNC) equipment, including manual, semi-automatic and automatic machines.

Where setting skills for NC/CNC is required unit MEM07015 Set computer controlled machines and processes should also be selected.

Where setting automated assembly processes is required unit MEM07040 Set multistage integrated processes should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07024	Operate and monitor machine and process
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Set machine**	2.1	Set up machine in accordance with defined procedures
		2.2	Adjust machine to meet specifications and operational requirements
		2.3	Measure first-off samples for compliance with specifications
		2.4	Identify worn or damaged tooling and change, as required
		2.5	Instruct machine operator, if necessary, on sequencing settings and any required safety procedures

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machining operations include one (1) or more of the following:	• removing metal • bending • rolling • joining • extruding • pressing • moulding and die casting on a range of materials, including metals, plastics and fibre

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07003B Perform machine setting (routine)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07003 Perform routine machine setting

Modification History

Release 1. Supersedes and is equivalent to MEM07003B Perform machine setting (routine)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting job/operation sheets, specifications and other reference material for routine machine setting
- setting machines using appropriate tools and equipment to meet specifications for the machine operation, including measuring first-off samples for compliance with specifications
- identifying and rectifying worn or damaged tooling
- instructing machine operators on correct use of the machine and safety procedures to be followed.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- strategies for conveying routine instructions
- sequences of machine setting operations
- techniques, tools and equipment used to measure samples
- characteristics of machines and machine processes
- tools and equipment for routine machine setting
- applicable machine tooling and accessories
- symptoms of tool wear.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine machine setting at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07004 Perform complex machine setting

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07004 Perform complex machine setting (Release 1).

Release 1. Supersedes and is equivalent to MEM07004B Perform machine setting (complex).

Application

This unit of competency defines the skills and knowledge required to perform complex machine setting on a range of non-numerical control (NC)/computer numerical control (CNC) production machines and processes, including manual, semi-automatic and automatic machines.

Where numerical control/computer numerical control skills are required unit MEM07015 Set computer controlled machines and processes should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following, including their prerequisites

MEM07006	Perform lathe operations
MEM07007	Perform milling operations
MEM07008	Perform grinding operations
MEM07013	Perform machining operations using horizontal and vertical boring machines
MEM07025	Perform advanced machine and process operation
MEM07026	Perform advanced plastic processing
MEM07027	Perform advanced press operations
MEM07041	Perform production machining

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Set machine**	2.1	Determine sequence of operations and set machine

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	accordingly
	2.2 Adjust machine to meet specifications and operational requirements
	2.3 Measure first-off samples and inspect for compliance with specifications
	2.4 Change tools and adjust settings to specification, as required
	2.5 Instruct machine operator, if necessary, on sequencing settings and any required safety procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Set includes the selection of one (1) or more of the following:	• gears • cams • trip dogs • pin boards • other timing mechanisms

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07004 Perform complex machine setting (Release 1).

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Release 1. Supersedes and is equivalent to MEM07004B Perform machine setting (complex).

Links

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Assessment Requirements for MEM07004 Perform complex machine setting

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07004 Perform complex machine setting (Release 1).

Release 1. Supersedes and is equivalent to MEM07004B Perform machine setting (complex).

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting job sheets, specifications and other applicable reference documents for complex machine setting
- setting machines using appropriate tools and equipment to meet specifications for the machine operation, including measuring first-off samples for compliance with specifications
- identifying and rectifying worn or damaged tooling
- instructing machine operators on correct use of complex machines and correct safety procedures to be followed.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics and hazards of complex machines and machine processes
- tooling, equipment and timing requirements of machine operations
- common product faults or defects and adjustments required to rectify
- strategies for instructing the machine operator and conveying routine instructions.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing complex machine setting at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07005 Perform general machining

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07005 Perform general machining (Release 1).

Release 1. Supersedes and is equivalent to MEM07005C Perform general machining.

Application

This unit of competency has been developed for Engineering Tradesperson – Mechanical apprenticeship training and the recognition of trade-level skills in non-computer numerical controlled (CNC) machining of ferrous and non-ferrous materials.

Where high level production machining applications are undertaken unit MEM07041 Perform production machining should be selected.

Where set-up and operation of electro-discharge machines (EDM) is required unit MEM07014 Perform electro-discharge machining (EDM) operations should also be selected.

Where machining is undertaken without undertaking any set up, including mounting of tools, setting of speeds, feeds and other operational parameters unit MEM07024 Operate and monitor machine and process and unit MEM07025 Perform advanced machine and process operation, should be selected as appropriate.

Where the selection and use of precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where substantial marking out is required unit MEM12006 Mark off/out (general engineering) should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

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Unit Weight: 8

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine sequence of**	2.1	Determine sequence of operations to meet job specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	operations	2.2	Select appropriate material and establish datum, as required
3	**Select and mount tools**	3.1	Select appropriate tools for job, sharpen and shape, as required
		3.2	Mount and position tools to meet requirements
4	**Perform machining operations**	4.1	Transfer dimensions to determine machining parameters
		4.2	Set machining parameters to meet job requirements and maximise tool life
		4.3	Ensure work is securely held to avoid damage to product, and meet safety requirements
		4.4	Perform machining to produce product to meet specifications
		4.5	Carry out routine maintenance and adjustments, as required
5	**Check components**	5.1	Check components for compliance with specifications
		5.2	Rectify non-compliant product in accordance with SOPs as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Operations include one (1) or more of the following:	• parallel cutting • slotting • planing • drilling • knurling • cutting flats • non-precision surface grinding operations
Materials include one (1) or more of the following:	• ferrous • non-ferrous
Measuring instruments include one (1) or more of the following:	• micrometres • vernier calipers • calipers • steel rules • dividers • scribers
Tools include the following:	• cutting tools • tool holders
Machining parameters include one (1) or more of the following:	• speeds • feeds • stops • coolant and cutting lubricants
Machines include one (1) or more of the following:	• lathes • mills • planers • shapers • slotters • surface grinder

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Maintenance and adjustments include one (1) or more of the following:	• machining parameters • slide and collar adjustment • cleaning and lubrication

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07005 Perform general machining (Release 1).

Release 1. Supersedes and is equivalent to MEM07005C Perform general machining.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07005 Perform general machining

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07005 Perform general machining (Release 1).

Release 1. Supersedes and is equivalent to MEM07005C Perform general machining.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning a job including identifying job requirements from drawings, instructions or specifications and a sequence of operations
- identifying any required tooling, measuring equipment and accessories
- selecting and mounting required tooling
- selecting material and marking out, as required
- performing machining to meet specifications
- checking machined components for conformance to specifications and identifying adjustments to be made to settings/tooling
- rectifying non-compliant components
- carrying out routine maintenance and adjustments, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of operations
- methods of work holding for machining operations
- transferring dimensions, including establishing datum points/lines
- geometry of cutting tools for a range of materials and applications
- reasons for maintaining properly sharpened cutting tools
- principles underpinning machining operations
- selection of feeds and speeds to suit a range of materials and operations
- methods of mounting a range of cutting tools
- safety precautions associated with clamping materials, guards and shields
- tolerances and limits of size

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- machine adjustment, lubrication and cleaning
- measurement techniques, tools and devices
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing general machining at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07006 Perform lathe operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07006 Perform lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07006C Perform lathe operations.

Application

This unit of competency has been developed for Engineering Tradesperson - Mechanical apprenticeship training and the recognition of trade-level skills in performing machining operations on a lathe to produce components to required tolerances and specifications using all types of accessories.

Skills covered by this unit are generally applied in occupational and work situations associated with trade-level fitting and machining work.

This unit does not cover turning of multi-start threads or use of taper turning attachment, copy turning attachment or multi-start threads.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operation
		2.2	Select tooling, using International Standard Organisation (ISO) standards or according to SOPs, to produce component to specification
		2.3	Set up job using appropriate measuring instruments
3	**Perform turning operations**	3.1	Calculate speeds and feeds
		3.2	Set up machine, changing gears and speed using a lead screw and appropriate mathematical techniques and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.		
			reference material
		3.3	Use the full range of accessories on a centre lathe
		3.4	Perform turning operations to specification
4	**Check components**	4.1	Check components for compliance with specifications
		4.2	Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tooling includes one (1) or more of the following:	• high speed steel, tungsten carbide, ceramic graphite and other standard cutting tools • boring bars • drills • reamers • thread chasers • tapping heads • taps
Instruments include one (1) or more of the following:	• manual and digital micrometres • vernier calipers • dial indicators • scribing blocks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Speeds and feeds include one (1) or more of the following:	• setting up machine • changing gears and speeds • use of lead screw • calculations
Accessories include the following:	• three and four jaw chucks • centres • face plate • steadies • cross slide • tailstock
Turning operations include one (1) or more of the following:	• manual parallel and taper turning • internal and external turning, including boring drilling, reaming, single start thread cutting and parting off

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07006 Perform lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07006C Perform lathe operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07006 Perform lathe operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07006 Perform lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07006C Perform lathe operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering drawings to AS 1100,401-1884 (R2014) Technical drawing to determine job requirements for lathe operations, including quantity, material, measurements and tolerances
- selecting cutting tools using International Standard Organisation (ISO) standards or according to SOPs from drawings, sketches, specifications and instructions, as appropriate
- fixing of job and tooling to specifications
- calculating and setting required speeds and feeds
- undertaking turning operations to specifications
- checking components for conformance to specifications
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence of lathe operations to achieve job requirements
- tool type and geometry to achieve required specifications and for work pieces of different materials
- numerical operations, geometry and calculations/formulae for lathe operations
- consequences of varying speeds and feeds from the optimum rates calculated
- characteristics of different materials and their effects on cutting speeds and feeds
- application of lathe accessories
- techniques, tools and equipment to measure materials and machined components
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing lathe operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07007 Perform milling operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07007 Perform milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07007C Perform milling operations.

Application

This unit of competency has been developed for Engineering Tradesperson - Mechanical apprenticeship training and the recognition of trade-level skills in using a range of milling machines to produce components to required tolerances and specifications using all types of accessories.

Skills covered by this unit are generally applied in occupational and work situations associated with trade-level fitting and machining work.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations to meet job specifications
		2.2	Select tooling, using International Standard Organisation (ISO) standards or according to SOPs, to produce component to specification
		2.3	Determine cutting parameters
3	**Perform milling operations**	3.1	Carry out milling operations to produce components to specification
		3.2	Undertake operations using conventional and/or climb milling techniques and a variety of cutters
		3.3	Use the full range of standard accessories

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Check components**	4.1 Check components for compliance with specifications
	4.2 Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Milling machines include one (1) or more of the following:	• vertical • horizontal • universal types
Tooling includes one (1) or more of the following:	• slab • gang • end • shell • slot • form • slitting cutters
Instruments include one (1) or more of the following:	• manual and digital micrometres • vernier calipers • dial indicators • scribing blocks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Cutting parameters include one (1) or more of the following:	• setting up machine • feed and speed calculations
Accessories include the following:	• dividing heads • rotary tables

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07007 Perform milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07007C Perform milling operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07007 Perform milling operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07007 Perform milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07007C Perform milling operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering drawings to AS 1100,401-1884 (R2014) Technical drawing to determine job requirements for milling operations, including quantity, material, measurements and tolerances
- selecting cutting tools using International Standard Organisation (ISO) standards or according to SOPs from drawings, sketches, specifications and instructions, as appropriate
- fixing of job and tooling to specifications
- calculating and setting required speeds and feeds
- undertaking milling operations to specifications
- checking components for conformance to specifications
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence of milling operations to achieve the job requirements
- cutter types and tooling geometry
- consequences of varying speeds and feeds from the optimum rates calculated
- effects of different materials on cutting speeds and feeds
- conventional and climb milling techniques and their applications
- application of each of the following:
  - slab
  - gang
  - shell
  - slot

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    - form and slitting
- use of dividing heads and rotary tables when milling components
- procedures for using dividing heads and rotary tables on milling machines
- appropriate techniques, tools and equipment to measure milled components
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:
    - have vocational competency in performing milling operations at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07008 Perform grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07008 Perform grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07008D Perform grinding operations.

Application

This unit of competency has been developed for Engineering Tradesperson - Mechanical apprenticeship training and the recognition of trad- level skills in performing grinding operations and checking finished components for conformance to specifications.

Skills covered by this unit are generally applied in occupational and work situations associated with trade-level fitting and machining work.

Where the selection and use of precision mechanical measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations to meet job specifications
		2.2	Select and apply appropriate holding devices
		2.3	Check machine guards, coolant and dust extraction devices
3	**Select grinding wheels and accessories**	3.1	Select and dress wheels based on knowledge of grinding wheel structure and application
		3.2	Select accessories to facilitate production to job specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

4	**Perform grinding operations**	4.1	Set up grinding machine and adjust in accordance with defined procedures
		4.2	Ensure work is securely held to avoid damage to product, and meet safety requirements
		4.3	Perform grinding operations to specifications
5	**Check components**	5.1	Check components for compliance with specifications
		5.2	Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Grinding machines include one (1) or more of the following:	• surface • cylindrical • centreless
Specifications include one (1) or more of the following:	• dimensions and tolerances • geometry and tolerances • surface finish
Holding devices include one (1)	• vices

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:	• clamps • magnetic chucks • face plates • collets • 3/4 jaw chuck
Wheels include one (1) or more of the following:	• shape • grit/bond composition
Balanced includes the following:	• static and dynamic balancing

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07008 Perform grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07008D Perform grinding operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07008 Perform grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07008 Perform grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07008D Perform grinding operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining requirements for grinding job, including quantity, material, measurements and tolerances
- planning a job, including identifying required measuring instruments and equipment, safety equipment, holding devices, grinding wheels, accessories and sequence of operations
- identifying guard, coolant and dust extraction requirements and checking equipment and coolant before grinding operation
- securely hold job for grinding operations
- performing grinding operation to specifications
- checking components for conformance to specifications
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of grinding operations
- application of a range of holding devices/accessories
- reasons for selecting specific work holding devices, tools, techniques and equipment
- coolant selection and function
- standard grinding wheel shapes
- range of abrasive materials used in grinding wheels
- factors impacting grinding wheel selection, including:
  - grain size of abrasive particles
  - grade or strength of bond

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    - bond material
- grinding wheel dressing tools and their application
- internal/external cylindrical grinding process
- principles of effective clamping
- grinding operations and procedures
- function of grinding accessories
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:
    - have vocational competency in performing grinding operations at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM07009 Perform precision jig boring operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07009 Perform precision jig boring operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07009B Perform precision jig boring operations.

Application

This unit of competency defines the skills and knowledge required to perform precision jig boring operations using a range of jig boring and milling machines.

It applies to operations where a range of jig boring and milling machine tools and accessories are used to achieve a high level of precision in finished products.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM07007	Perform milling operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations
		2.2	Select tools and accessories to meet job specifications
		2.3	Set up job using appropriate measuring instruments
3	**Perform jig boring**	3.1	Bore holes relative to coordinate position and to specification
		3.2	Use rotary or tilting rotary table, as required
4	**Check components**	4.1	Check components for compliance with specifications
		4.2	Rectify non-compliant product in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tools and accessories include one (1) or more of the following:	• cutting tools • tool attachments • harts and nomograms • rotary table • tilting rotary table
Instruments include one (1) or more of the following:	• dial test indicators • digital read out equipment
Appropriate techniques include the following:	• measuring techniques and comparison methods

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07009 Perform precision jig boring operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07009B Perform precision jig boring operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07009 Perform precision jig boring operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07009 Perform precision jig boring operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07009B Perform precision jig boring operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning a job, including identifying job requirements from drawings, instructions or specifications and sequence of operations
- identifying any required tooling, measuring equipment and accessories
- selecting and mounting required material for jig boring operations
- performing jig boring to specifications
- checking machined components for conformance to specifications and making required adjustments to machining parameters
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of operations
- application of rotary and tilting rotary tables to jig boring operations
- checks to be conducted for conformance to specifications
- appropriate techniques, tools and equipment to measure machined components
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing precision jig boring operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07010 Perform tool and cutter grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07010 Perform tool and cutter grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07010B Perform tool and cutter grinding operations.

Application

This unit of competency defines the skills and knowledge required to perform a range of tool and cutter grinding operations, including the use of precision measuring instruments.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM07008	Perform grinding operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations
		2.2	Check machine guards, coolant and dust extraction devices
		2.3	Select, balance and dress tool and cutter grinding wheels based on shape and grit/bond composition
		2.4	Select accessories to facilitate production to specification
3	**Perform tool and cutter grinding**	3.1	Operate universal tool and cutter grinding machines to sharpen and shape tools and cutters
		3.2	Carry out parallel internal and/or external grinding
		3.3	Carry out internal and/or external taper grinding to drawing specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Check components for conformance to specification using appropriate techniques, tools and equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tools and cutters include one (1) or more of the following:	• side and face cutters • end mill • form relieved milling cutters • flat • vee and circular form tools and hobs • slitting saws • drills

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07010 Perform tool and cutter grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07010B Perform tool and cutter grinding operations.

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Assessment Requirements for MEM07010 Perform tool and cutter grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07010 Perform tool and cutter grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07010B Perform tool and cutter grinding operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting drawings and job specifications to determine required tool and cutting grinding requirements
- selecting suitable equipment and tools to carry out the cutting and grinding operation
- operating the cutting and grinding machines to ensure the job is completed to specifications using appropriate testing and measuring techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of cutting and grinding operations
- function of coolant and dust extraction devices
- criteria for grinding wheel selection, including:
  - grain size of abrasive particles
  - grade or strength of bond
  - bond material
- grinding wheel dressing procedures and wheel dressing tools
- sources of data on tool geometry for the full range of tools and cutters, including the terminology used to describe the tool geometry
- procedures to be followed when parallel grinding on a tool and cutter grinder
- procedures to be followed when grinding tapers on a tool and cutter grinder
- tools, techniques and equipment used to check ground components for conformance with the following specifications:
  - dimensions and tolerances

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- geometry and tolerances
- surface finish.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing tool and cutter grinding operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring State as the case requires
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07011 Perform complex milling operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07011 Perform complex milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07011B Perform complex milling operations.

Application

This unit of competency defines the skills and knowledge required to perform complex milling operations on a range of materials, including non-standard metals and alloys.

It applies to a range of complex milling operations, including jobs requiring high precision or quality and operations requiring complex calculations.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM07007	Perform milling operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select milling cutters**	2.1	Select correct milling cutter/s for required operation
		2.2	Select correct cutter inserts using International Standard Organisation (ISO) standards as required, and mount in cutter blank
		2.3	Mount cutter to machine spindle and check for concentricity
3	**Set up work**	3.1	Determine the cutting parameters and steps required to mill components
		3.2	Set up machine with appropriate accessories for milling operations, as required
		3.3	Set up work to required level of accuracy

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Perform complex milling**	4.1 Perform calculations as necessary to achieve specifications for component to be milled
	4.2 Check components for compliance with specifications
	4.3 Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Complex milling operations include one (1) or more of the following:	• cutting of one or more of the following:
	  • spur gears
	  • racks
	  • helical gears
	  • radial uniform rise cam lobes

Milling cutter/cutters include one (1) or more of the following:	• ganged cutters • form cutters
Set up includes the following:	• verifying using instruments, including dial test indicators and sine bars
Appropriate accessories	• omniversal tables

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

include the following:
- differential dividing heads

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07011 Perform complex milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07011B Perform complex milling operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07011 Perform complex milling operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07011 Perform complex milling operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07011B Perform complex milling operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to carry out complex milling operations
- selecting appropriate cutter inserts for cutting operations according to specifications and ISO standards
- calculating cutting parameters, including speeds, feeds and ratios
- setting up gear trains according to calculations and standard operating procedures
- perform complex milling using dividing heads and omniversal tables to specifications
- checking components for conformance to specifications using precision measuring instruments
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- precision measuring equipment and their applications
- procedures for accurately setting up work
- ISO standards applicable to milling cutter inserts
- procedures for milling components, such as racks and gears
- calculations, geometry and formulae relating to complex milling activities
- accessories used for complex milling
- applications and use of omniversal tables and differential dividing heads to complex milling operations
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing complex milling operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07012 Perform complex grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07012 Perform complex grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07012B Perform complex grinding operations.

Application

This unit of competency defines the skills and knowledge required to perform complex and high precision grinding operations.

Grinding operations are performed on a variety of materials to achieve high levels of precision for dimensions and finish.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM07008	Perform grinding operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Set up work**	2.1	Select grinding wheels based on shape and grit/bond composition and dress to form and size, as required
		2.2	Set up work to required level of accuracy according to specifications
3	**Perform complex grinding**	3.1	Perform specialised grinding operations on components
		3.2	Check components for compliance with specifications
		3.3	Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Complex and high precision grinding operations include one (1) or more of the following:	• jig grinding • grinding eccentrics • thread grinding • gauges • shapes and forms

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07012 Perform complex grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07012B Perform complex grinding operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07012 Perform complex grinding operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07012 Perform complex grinding operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07012B Perform complex grinding operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to carry out complex grinding operations
- dressing grinding wheel to form and size
- setting up work pieces for the operations and selecting suitable tools and accessories
- undertaking numerical operations, geometry and calculations for specialised complex grinding operations
- carrying out a range of complex grinding operations
- checking components for conformance to specifications using precision measuring instruments
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of complex grinding operations
- function and application of work holding devices/accessories appropriate to complex grinding
- appropriate techniques, tools and equipment to measure machined components
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing complex grinding operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM07013 Perform machining operations using horizontal and vertical boring machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07013 Perform machining operations using horizontal and vertical boring machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07013B Perform machining operations using horizontal and/or vertical boring machines.

Application

This unit of competency defines the skills and knowledge required to perform horizontal and vertical boring operations on standard engineering materials using cutting tools and precision measuring instruments.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations to meet job specifications
		2.2	Select tools to produce component to specification using International Standard Organisation (ISO) or SOPs
		2.3	Determine cutting parameters
3	**Perform boring operations**	3.1	Carry out horizontal and vertical boring operations to drawing specifications
		3.2	Check components for compliance with specifications
		3.3	Rectify non-compliant product in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Horizontal boring machines include one (1) or more of the following:	• table type • floor type
Vertical boring machines include one (1) or more of the following:	• double column • single column
Horizontal and vertical boring operations include one (1) or more of the following:	• parallel line and taper boring • facing • turning • drilling • reaming

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07013 Perform machining operations using horizontal and vertical boring machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07013B Perform machining operations using horizontal and/or vertical boring machines.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07013 Perform machining operations using horizontal and vertical boring machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07013 Perform machining operations using horizontal and vertical boring machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07013B Perform machining operations using horizontal and/or vertical boring machines.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to carry out boring operations
- selecting, mounting and positioning cutting tools
- calculating and selecting cutting parameters, including speeds and feeds
- performing horizontal and vertical boring operations to specified cutting parameters
- checking components for conformance to specifications using precision measuring instruments
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of boring operations
- geometry of cutting tools for a range of materials
- calculations for determining cutting parameters and checking tolerances
- consequences of varying the speeds and feeds from the optimum rates
- procedures and techniques for carrying out horizontal and vertical boring operations
- appropriate techniques, tools and equipment to measure machined components
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing machining operations using horizontal and vertical boring machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07014 Perform electro-discharge machining (EDM) operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07014 Perform electro-discharge machining (EDM) operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07014B Perform electro-discharge (EDM) machining operations.

Application

This unit of competency defines the skills and knowledge required to perform electro-discharge machining (EDM) operations and applies to a range of EDM operations and engineering materials.

This unit has been primarily developed for Engineering Tradesperson - Mechanical apprenticeship training and the recognition of trade-level skills in performing EDM operations.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where electrodes are required to be manufactured see appropriate machining units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Determine sequence of operations
		2.2	Select correct electrode to ensure finished component conforms to drawing specifications
		2.3	Calculate electrode surface area and set process parameters to give safe, accurate and efficient operation
		2.4	Set up job relative to electrode to ensure required position is obtained
3	**Perform EDM**	3.1	Operate electro-discharge machine to produce

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	components to drawing specifications
	3.2 Check components for compliance with specifications
	3.3 Rectify non-compliant product in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Electrodes include the following:	• all types and grades of graphite electrodes
Job set up includes the following:	• correct use of work holding devices and selection of EDM fluids, spark generation, cycle time, power settings and dielectric fluids for the requirement of a particular job

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07014 Perform electro-discharge machining (EDM) operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07014B Perform electro-discharge (EDM) machining operations.

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Assessment Requirements for MEM07014 Perform electro-discharge machining (EDM) operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07014 Perform electro-discharge machining (EDM) operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07014B Perform electro-discharge (EDM) machining operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and other applicable reference documents with respect to performing electro-discharge machining (EDM) operations
- determining the coordinates of the work pieces relative to the machine datum
- calculating machining parameters necessary in achieving the safe, accurate and efficient machining of the work piece
- calculating the electrode surface area and selecting the correct electrodes for the job
- setting up job using appropriate holding devices and accessories
- performing EDM operations to produce components to specifications
- checking components for conformance to specifications using precision measuring instruments
- rectifying non-compliant product.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence of operations to achieve the EDM job requirements
- electrode types and geometry required to achieve the specified outcome
- effects of material to be machined on the electrode material and geometry
- procedures for producing electrodes for the electro-discharge machining process
- coordinates of the feature(s) to be machined
- coordinates of the electrode relative to the machine datum
- procedures for operating the electro-discharge machine to produce components
- tools, techniques and equipment appropriate to the checking of machined components

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- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components
- reasons for selecting the tools, techniques and equipment to be used.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing electro-discharge machining (EDM) operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07015 Set computer controlled machines and processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07015 Set computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07015B Set computer controlled machines and processes.

Application

This unit of competency defines the skills and knowledge required to set computer controlled machines and processes.

All technical difficulties are resolved in consultation with appropriate technical advisers.

Where the setting of non-computer controlled machines or processes is required unit MEM07003 Perform routine machine setting should be selected.

Where the selection and use of general machining is required unit MEM07005 Perform general machining should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following, including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Mount work holding fixtures/devices/tools**	2.1	Prepare machine to accept work holding fixtures/devices/ tools
		2.2	Mount pre-set tooling into machine/equipment, as required
		2.3	Set work holding fixtures/devices on machine
		2.4	Identify/verify tool offset or datum settings against job sheet
		2.5	Load and select program and verify in accordance with

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		job instructions
3 **Conduct pre-start checks**	3.1	Undertake pre-start checks
	3.2	Observe correct safety procedures and check safety equipment for correct operation
4 **Set machine**	4.1	Set/adjust machine to meet operational requirements and specifications
	4.2	Check production samples for compliance with specifications
	4.3	Replace pre-set tools, adjust tool offsets or take other corrective action in accordance with SOPs, as required
	4.4	Instruct operator, if necessary, ensuring that all safety procedures and devices are in place

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machines include one (1) or more of the following:

- numerically controlled (NC) machines
- computer numerically controlled (CNC) machines
- industrial robots

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07015 Set computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07015B Set computer controlled machines and processes.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07015 Set computer controlled machines and processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07015 Set computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07015B Set computer controlled machines and processes.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents with respect to setting computer controlled machines and processes
- selecting appropriate tool and work piece holding fittings and fixtures
- mounting pre-set tooling and verifying tool offsets and/or datum settings against job sheets or instructions
- undertaking numerical operations and calculations in carrying out setting of machines and processes
- loading and verifying programs
- conducting pre-start checks, including checking safety features and safety equipment, for correct operation
- setting and adjusting machine
- measuring and verifying first-off samples for conformance with specifications
- identifying worn or damaged tooling and taking appropriate corrective action
- instructing machine operator on the sequence of operations.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- work holding fixtures/devices/tools and pre-set tooling for different machines and processes
- procedures for mounting work holding fixtures/devices/tools
- location of work holding fixtures/devices/tools relative to the machine datum or zero
- reasons for establishing tool offsets

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- purpose of datum settings and sources of information on tool offsets and datum settings
- procedures to locate, load and verify programs
- pre-start checks, processes and procedures
- purpose and function of machine safety features and/or safety equipment
- machine/process, setting and operating procedures
- adjustments that can be made to the machine/process and the effect of adjustments on machine and operational specifications
- product or part specifications in relation to the machining process
- measuring devices for checking parts or products
- examples, effects and corrective action for worn or damaged tooling.

Assessment Conditions

- Assessors must:
  - have vocational competency in setting computer controlled machines and processes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07016 Set and edit computer controlled machines and processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07016 Set and edit computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07016C Set and edit computer controlled machines and processes.

Application

This unit of competency defines the skills and knowledge required to set and edit computer controlled machines and processes.

Work is performed to established processes, practices and specifications and machine operations, including welding, metal cutting, forming and shaping.

Technical difficulties are resolved in consultation with appropriate technical advisers.

Where setting and editing of computer controlled thermal cutting machines is required unit MEM05053 Set and edit computer controlled thermal cutting machines should also be selected.

Where additional machining skills in excess of unit MEM07005 Perform general machining are required then appropriate units should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: 4

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Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following, including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Set work holding fixtures/devices/tools**	2.1	Select correct ancillary devices and attach to machine
		2.2	Prepare machine to accept work holding devices
		2.3	Set work holding fixtures/devices/tools to zero or a datum using appropriate setting devices
		2.4	Measure tooling offsets and record in machine controller
3	**Trial program**	3.1	Operate machine to produce first-off samples, observing all safety procedures
		3.2	Check first-off samples for compliance with specifications
		3.3	Undertake program editing to change speeds, feed and operational sequence requirements to ensure job conforms to specification
		3.4	Replace tools, adjust tool offsets or take other corrective action using SOPs, where appropriate
		3.5	Instruct operator, if necessary, ensuring that all safety procedures and devices are in place

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machines include one (1)	• numerically controlled (NC) machines

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:
- computer numerically controlled (CNC) machines
- industrial robots

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07016 Set and edit computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07016C Set and edit computer controlled machines and processes.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07016 Set and edit computer controlled machines and processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07016 Set and edit computer controlled machines and processes (Release 1).

Release 1. Supersedes and is equivalent to MEM07016C Set and edit computer controlled machines and processes.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents for computer controlled machine setting and editing
- attaching ancillary devices in accordance with procedures
- selecting appropriate tool and work piece holding fittings and fixtures
- measuring, entering and verifying tool offsets
- undertaking numerical operations and calculations in setting and editing machines and processes
- conducting pre-start checks
- producing and checking first-off samples for conformance with specifications
- editing programs to ensure compliance with specifications
- identifying worn or damaged tooling and taking appropriate corrective action
- instructing machine operator on the sequence of operations.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- ancillary equipment and their applications
- procedures for attaching the ancillary devices to the numerically controlled (CN) and computer numerically controlled (CNC) machines
- work holding devices, their application and procedures for mounting them
- location of work holding fixtures/devices/tools relative to the machine zero or datum
- reasons for establishing tool offsets
- procedures and devices for measuring tool offsets

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- procedures for entering, verifying and adjusting tool offset
- operating procedures
- safety features and equipment
- measuring devices/ techniques for checking the parts or product
- effects of changes to cutting feeds and speeds and the impact of changes to the sequence of operations on the part or product to be produced
- procedures for editing programs via the machine controller
- the sequence of operations of the machine/process
- examples of, effects and corrective action to be taken for worn or damaged tooling.

Assessment Conditions

- Assessors must:
  - have vocational competency in setting and editing computer controlled machines and processes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07018 Write basic NC and CNC programs

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07018 Write basic NC and CNC programs (Release 1).

Release 1. Supersedes and is equivalent to MEM07018C Write basic NC/CNC programs.

Application

This unit of competency defines the skills and knowledge required to write basic numerically controlled (NC) and computer numerically controlled (CNC) machine programs.

It extends to writing a program to describe simple machine operations, including tool paths, using appropriate software for machines. The program may use common M and G codes but does not include the programming of advanced operations using canned cycles and sub-routines. Technical difficulties are resolved in consultation with appropriate technical advisers.

Where basic programming of computer controlled thermal cutting machines is required unit MEM05054 Write basic NC/CNC programs for thermal cutting machines should also be selected.

Where additional machining skills in excess of unit MEM07005 Perform general machining are required appropriate units should also be selected.

Where programming of advanced operations using canned cycles and sub-routines is required unit MEM07019 Program NC and CNC machining centre should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

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Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM07016	Set and edit computer controlled machines and processes
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following, including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.5	Select appropriate NC and CNC program elements for machine controller
2	**Write basic NC and CNC machine program**	2.1	Interpret engineering drawings to define basic machines, function and tool path geometry
		2.2	Calculate coordinates for simple tool path or basic machining functions
		2.3	Write program in standard code format in accordance with SOPs
		2.4	Produce operation sheets to specification in accordance with SOPs
3	**Trial program**	3.1	Operate machine in manual mode to test and prove program
		3.2	Edit program, if necessary, to adjust operation, as required
		3.3	Check components for conformance to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Basic machines	• single spindles

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

incorporate one (1) or more of the following:	• single tools turrets • B axis angular • tool changers • component loaders of a pallet type, but excludes multiple spindles
Machine operations include one (1) or more of the following:	• welding • thermal cutting • metal cutting • forming and shaping

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07018 Write basic NC and CNC programs (Release 1).

Release 1. Supersedes and is equivalent to MEM07018C Write basic NC/CNC programs.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07018 Write basic NC and CNC programs

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07018 Write basic NC and CNC programs (Release 1).

Release 1. Supersedes and is equivalent to MEM07018C Write basic NC/CNC programs.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in writing basic numerically controlled (NC) and computer numerically controlled (CNC) programs
- calculating coordinates for tooling and producing operation sheets for the program and process
- writing NC and CNC machine programs using standard code format
- producing NC/CNC operation sheets
- operating the machine to test it operates to specification undertaking any required editing of the program
- checking parts or products for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- elements of a basic NC and CNC program and the function of elements in controlling the operation of NC and CNC machine
- machining operations
- types of NC and CNC machines and their applications
- machining operations controlled by program
- tool paths to be followed when producing a part or product
- sequence of machining operations and the reasons for selecting tool paths and sequence of operations
- purpose of the zero point of the NC and CNC machine

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- standard codes and procedures for writing used in NC and CNC programs and their applications
- procedures for completing NC and CNC operation sheets and the information to be included in NC and CNC operation sheets
- procedures for manual operation of the NC and CNC machine
- reasons for testing and proving the NC and CNC program
- procedures for editing the NC and CNC program via the machine controller and the effects of editing on the operation of the NC and CNC machine and the part or product to be produced
- measuring equipment/techniques used to check for conformance to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in writing basic NC and CNC programs at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07019 Program NC and CNC machining centre

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07019 Program NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07019C Program NC/CNC machining centre.

Application

This unit of competency defines the skills and knowledge required to write and trial programs for numerically controlled (NC) and computer numerically controlled (CNC) machining centres.

The program may use common M and G codes and includes the programming of advanced operations, using canned cycles and sub-routines. Programs are trialled and edited as necessary to adjust operation of centre. Technical difficulties are resolved in consultation with appropriate technical advisers.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 2

Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM07016	Set and edit computer controlled machines and processes
MEM07018	Write basic NC and CNC programs
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Select appropriate NC and CNC program elements for machine controller
2	**Write basic NC and CNC machine program**	2.1	Interpret engineering drawings to define machine function and tool path geometry
		2.2	Calculate coordinates for tool path or machine functions, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.3	Select advanced operations using canned cycles and sub-routines and apply
	2.4	Write program in standard code format in accordance with SOPs
	2.5	Produce operation sheets to specification in accordance with SOPs which includes appropriate Australian Standards, where required
3 **Trial program**	3.1	Operate machine in manual mode to test and prove program
	3.2	Edit program, if necessary to adjust operation, as required
	3.3	Check components to conform to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Basic machines incorporate one (1) or more of the following:	• single spindles • single tools turrets • B axis angular • tool changers • component loaders of a pallet type, but excludes multiple spindles and multiple axis

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07019 Program NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07019C Program NC/CNC machining centre.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07019 Program NC and CNC machining centre

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07019 Program NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07019C Program NC/CNC machining centre.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in programming numerically controlled (NC) and computer numerically controlled (CNC) machining centres
- calculating coordinates for tooling and producing operation sheets for the program and process
- writing NC/CNC program in standard code format and incorporating, where appropriate, canned cycles and sub-routines
- producing NC/CNC operation sheets in accordance with SOPs
- operating the machine centre to test it operates to specification including undertaking any required editing of the program
- checking components or products for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- elements of NC and CNC program and the function of elements in controlling the operation of NC and CNC machines
- machining operations to be performed in the manufacture of the given part or product
- appropriate types of NC and CNC machines to perform the required machining operations
- machining operations to be controlled by the program to be written
- tool paths to be followed when producing the part or product and the sequence and reasons for selecting the sequence of machining operations to be programmed
- zero point of the NC and CNC machine

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- canned cycles and sub-routines accessible in a particular NC and CNC machine and the application of each canned cycle and sub-routine available
- canned cycles and/or sub-routines to be used in the NC and CNC program and reasons for selecting the chosen canned cycles and/or sub-routines
- standard codes and their application used in the writing of NC and CNC programs
- procedures for writing NC and CNC programs in standard code format
- procedures for completing NC and CNC operation sheets and information to be included
- relevant Australian Standards for programming of NC and CNC machine centres
- procedures for manual operation of the NC and CNC machine
- reasons for testing and proving the NC and CNC program
- procedures for editing the NC and CNC program via the machine controller and the effects of editing on the operation of the NC and CNC machine and the part or product to be produced
- specifications of the part or product and measuring equipment/techniques to be used to check for conformance with specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming NC and CNC machining centre at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07020 Program multiple spindle and multiple axis NC and CNC machining centre

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07020 Program multiple spindle and multiple axis NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07020C Program multiple spindle and/or multiple axis NC and CNC machining centre.

Application

This unit of competency defines the skills and knowledge required to identify numerically controlled (NC) and computer numerically controlled (CNC) machine program elements, write and trial a machine program for multiple spindle and multiple axis NC and CNC machining centres, and prepare an operation sheet.

The program may use common M and G codes and include the programming of advanced operations, using canned cycles and sub-routines. Programs are trialled and edited as necessary to adjust operation of centre. Technical difficulties are resolved in consultation with appropriate technical advisers.

Where additional machining skills in excess of MEM07005 Perform general machining are required appropriate units should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 2

Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM07016	Set and edit computer controlled machines and processes

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MEM07018	Write basic NC and CNC programs
MEM07019	Program NC and CNC machining centre
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following, including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.5	Select appropriate program elements for machine controller
2	**Write NC and CNC machine program**	2.1	Interpret engineering drawings to define machine function and tool path geometry
		2.2	Calculate coordinates for tool path or machine functions, as required
		2.3	Select advanced operations using canned cycles and sub-routines and apply
		2.4	Write program in standard code format in accordance with SOPs
		2.5	Produce operation sheets to specification in accordance with SOPs which includes appropriate Australian Standards, where required
3	**Trial program**	3.1	Operate machine in manual mode to test and prove program
		3.2	Edit program, if necessary to adjust operation, as required
		3.3	Check components to conform to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machines incorporate one (1) or more of the following:	• multiple spindles and/or multiple axis/B axis angular • multiple tool turrets • tool changers • component loaders of a pallet type single spindles

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07020 Program multiple spindle and multiple axis NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07020C Program multiple spindle and/or multiple axis NC and CNC machining centre.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07020 Program multiple spindle and multiple axis NC and CNC machining centre

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07020 Program multiple spindle and multiple axis NC and CNC machining centre (Release 1).

Release 1. Supersedes and is equivalent to MEM07020C Program multiple spindle and/or multiple axis NC and CNC machining centre.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in programming multiple spindle and multiple axis numerically controlled (NC) and computer numerically controlled (CNC) machining centres
- calculating coordinates for tooling and producing operation sheets for the program and process
- writing NC and CNC programs in standard code format and incorporating, where appropriate, canned cycles and sub-routines
- producing NC and CNC operation sheets in accordance with SOPs
- operating the multiple spindle and multiple axis NC and CNC machining centre to test it operates to specification undertaking any required editing of the program
- checking components or products for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- elements of NC and CNC program and the function of elements in controlling the operation of NC and CNC machine
- machining operations to be performed in the manufacture of the given part or product
- appropriate types of NC and CNC machines to perform the required machining operations
- machining operations to be controlled by the program to be written
- tool path(s) to be followed when producing the part or product
- sequence of machining operations to be programmed and reasons for selecting the chosen tool path(s) and sequence of operations

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- zero point of the NC and CNC machine
- canned cycles and sub-routines accessible in the particular NC and CNC machine and the application of each canned cycle and sub-routine available
- canned cycles and/or sub-routines to be used in the NC and CNC program and reasons for selecting the chosen canned cycles and/or sub-routines
- standard codes and their application used in the writing of NC and CNC programs
- procedures for writing NC and CNC programs in standard code format
- procedures for completing NC and CNC operation sheets and the information to be included
- relevant Australian Standards for programming multiple spindle and multiple axis NC and CNC machining centres
- procedures for manual operation of a NC and CNC machine
- reasons for testing and proving a NC and CNC program
- procedures for editing the NC and CNC program via the machine controller and the effects of editing on the operation of the NC and CNC machine and the part or product to be produced
- specifications of the part or product and measuring equipment/techniques to be used to check for conformance with specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming multiple spindle and multiple axis NC and CNC machining centres at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07021 Perform complex lathe operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07021 Perform complex lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07021B Perform complex lathe operations.

Application

This unit of competency defines the skills and knowledge required to perform complex turning operations on a range of materials, including non-standard metals and alloys.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07005	Perform general machining
MEM07006	Perform lathe operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Set up work on lathe**	2.1	Determine sequence of operations, including job set-up, for maximum efficiency to meet job specifications
		2.2	Set up work on the lathe to required level of accuracy using precision instruments, including dial test indicators
		2.3	Balance work piece when using face plates to ensure accuracy in machining, as required
		2.4	Set up work piece to ensure that work piece is free of distortion following completion of machining
3	**Select and prepare tooling**	3.1	Select tooling, accessories and consumables appropriate to task, specifications and material
		3.2	Determine cutting tool modifications required to perform complex turning operations, where appropriate
		3.3	Prepare tooling and accessories and modify, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.4	Apply International Standard Organisation (ISO) standards for cutting tools or other appropriate standards to suit cutting parameters
4 **Perform complex turning**	4.1	Calculate speeds and feeds using appropriate mathematical techniques and reference material
	4.2	Undertake complex turning to specifications and workplace procedures
	4.3	Measure work piece and verify in accordance with specifications using precision measuring equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tooling includes one (1) or more of the following:	• cutting tools • form tools • boring bars • drills • reamers • thread chasers • tapping heads • taps
Complex turning	• single-start and multi-start thread cutting

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

includes one (1) or more of the following:

- internal blind hole thread cutting
- eccentrics
- copy and taper turning
- counterbalancing work on face plates
- mandrel work
- trepanning
- heavy (multi-tonne) shafts

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07021 Perform complex lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07021B Perform complex lathe operations.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07021 Perform complex lathe operations

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07021 Perform complex lathe operations (Release 1).

Release 1. Supersedes and is equivalent to MEM07021B Perform complex lathe operations.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in performing complex lathe operations
- setting and supporting work to avoid distortion on release of clamping devices
- selecting and setting up cutting tooling or inserts as appropriate to turning operation
- calculating cutting parameters, speeds and feeds to meet job requirements
- modifying tooling and accessories, as required
- performing complex turning operations according to specifications
- checking machined components for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- precision measuring equipment and measuring techniques used in complex turning operations and reasons for selecting different measuring equipment
- procedures for accurately setting up work for a variety of techniques
- International Standards Organisation (ISO) or other standards applicable to cutting tool inserts
- cutting parameters for the given task
- feeds and speeds for complex turning operations
- formulae and data relating to feeds and speeds
- techniques and procedures for carrying out the following turning operations:
  - single-start thread cutting
  - multi-start thread cutting
  - internal blind hole thread cutting

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- eccentrics
- copy turning
- taper turning
- counter balancing work on face plates
- mandrel work
- trepanning
- heavy (multi-tonne) shafts.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing complex lathe operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07022 Program CNC wire cut machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07022 Program CNC wire cut machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07022C Program CNC wire cut machines.

Application

This unit of competency defines the skills and knowledge required to write and trial a program for computer numerically controlled (CNC) wire cut machines. Technical difficulties are resolved in consultation with appropriate technical advisers.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 2

Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM07016	Set and edit computer controlled machines and processes
MEM07018	Write basic NC and CNC programs
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Write CNC wire cut program**	2.1	Interpret engineering drawings to define optimum tool path geometry
		2.2	Program tool path using advanced operations, canned cycles and sub-routines or other appropriate sub-routines within system
		2.3	Write program in standard code format, and confirm and edit, as necessary
		2.4	Store program in accordance with SOPs
		2.5	Produce operation sheets to specification in accordance with SOPs which includes appropriate Australian

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	Standards, where required

3	**Trial CNC wire cut program**	3.1	Download program and select machining parameters
		3.2	Prepare machine, load and align work piece, establish datum and reference points
		3.3	Operate machine in appropriate mode to test and prove program and work piece positioning
		3.4	Check finished components for conformance with specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Programming includes one (1) or more of the following:	• 2 axis tool paths • 4 axis conical cutting • auto multi-cavity work pieces
Program includes setting of one (1) or more of the following:	• speeds • tolerances • taper angles • macros • nesting tool paths • chained linear tool paths • differential profiles

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machining parameters include one (1) or more of the following:	• wire offset • wire speed • power settings

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07022 Program CNC wire cut machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07022C Program CNC wire cut machines.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07022 Program CNC wire cut machines

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07022 Program CNC wire cut machines (Release 1).

Release 1. Supersedes and is equivalent to MEM07022C Program CNC wire cut machines.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in programming computer numerically controlled (CNC) wire cutting machines
- calculating coordinates of all relevant points on the part or product to be produced
- writing a CNC wire cut program tool path using advanced operations, canned cycles and sub-routines
- storing the program and producing an operations sheet in accordance with SOPs for the programs use
- downloading program and setting parameters
- loading, aligning and operating machine to test the program
- checking components or products for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operations to be controlled by the program to be written
- tool path(s) to be followed when producing the part or product and the sequence of operations to be programmed with reasons for selecting the chosen tool path(s) and sequence of operations
- techniques for determining the zero point of a wire cut machine
- canned cycles and sub-routines accessible in the particular CNC wire cut machine and the application of each canned cycle and sub-routine available
- canned cycles and/or sub-routines to be used in the CNC wire cut program and reasons for selecting the chosen canned cycles and/or sub-routines

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- standard codes used in the writing of CNC wire cut programs and their application
- procedures for writing and storing CNC wire cut programs in standard code format
- procedures for completing CNC wire cut operation sheets and the information to be included
- procedures for downloading and verifying CNC wire cut programs
- machining parameters that may be entered into the machine controller and the effect of varying the machining parameters on the product or part produced
- work holding fixtures/devices/tools and procedures for mounting work holding fixtures/devices tools
- location of the required work holding fixtures/devices/tools relative to the machine datum or zero
- purpose of datum setting
- pre-start checks and the purpose and function of safety features and equipment of the CNC wire cut machine
- machine mode appropriate to the testing and proving of the CNC wire cut program and the checking of the position of the work piece and procedures to be followed when using the machine in this mode
- relative position of the work piece to the machine datum or zero
- specifications of the part or product and measuring equipment/techniques to be used to check for conformance to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming CNC wire cutting machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07023 Program and set up CNC manufacturing cell

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07023 Program and set up CNC manufacturing cell (Release 1).

Release 1. Supersedes and is equivalent to MEM07023C Program and set up CNC manufacturing cell.

Application

This unit of competency defines the skills and knowledge required to program operations, set up and test the operation of a cell and extends to computer numerically controlled (CNC) machines and associated integrated equipment/robots used in flexible manufacturing cell and other advanced operations.

Where additional machining skills in excess of unit MEM07005 Perform general machining are required appropriate units should also be selected.

Where the selection and use of precision mechanical measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM07015	Set computer controlled machines and processes
MEM07016	Set and edit computer controlled machines and processes
MEM07018	Write basic NC and CNC programs
MEM07019	Program NC and CNC machining centre

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MEM07020	Program multiple spindle and multiple axis NC and CNC machining centre
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following including their prerequisites:

MEM07005	Perform general machining
MEM07028	Operate computer controlled machines and processes

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Program operations**	2.1	Interpret engineering drawings and manufacturing specifications to determine required equipment
		2.2	Program equipment/cell schedule
		2.3	Link controllers for integration
3	**Set up cell**	3.1	Configure manufacturing cell machines and equipment to meet production specifications
		3.2	Install tooling and work holding devices and adjust to meet specifications
		3.3	Operate cell and adjust to produce components to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

CNC manufacturing cell includes (1) one or more of the following:	• multi-spindle machines • 4 and 5 axis machines • pallet loaded machining centres

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM07023 Program and set up CNC manufacturing cell (Release 1).

Release 1. Supersedes and is equivalent to MEM07023C Program and set up CNC manufacturing cell.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07023 Program and set up CNC manufacturing cell

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM07023 Program and set up CNC manufacturing cell (Release 1).

Release 1. Supersedes and is equivalent to MEM07023C Program and set up CNC manufacturing cell.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents in programming and setting up computer numerically controlled (CNC) manufacturing cell
- loading/downloading CNC programs into individual machine controllers
- writing CNC programs
- linking machine controllers of CNC machines and transferring devices
- positioning machines and equipment to optimise manufacturing cell performance
- selecting and installing tooling and operating the cell to produce components
- checking components or products for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operations to be performed in producing a given part or product
- appropriate types of CNC machines to perform required machining operations
- appropriate means of part or product transfer between machines and reasons for selecting the chosen equipment and machinery
- CNC programs for use in each of the cell components
- sequence of machining and transfer operations and the means of coordinating the operations of all components within the cell
- communication requirements between components of the cell and methods of linking machine controllers
- precautions to be taken when linking machine controllers

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- optimum physical relationship between the machines and equipment within a cell
- reasons for selecting a configuration of machines and equipment and appropriate tooling for each component of the cell with reasons for tooling selection
- appropriate work holding devices for each component of the cell and reasons for selecting the chosen work holding devices
- effects of adjustments to tooling and/or work holding devices on the part or product specifications
- operating procedures for a manufacturing cell
- measurements to be taken to check a part or product for conformance to specification and the techniques/equipment to be used to measure the part or product
- effect of adjustments on cell performance
- causes of non-essential dwell times and action to be taken to minimise dwell times.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming and setting up a CNC manufacturing cell at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07024 Operate and monitor machine and process

Modification History

Release 1. Supersedes and is equivalent to MEM07024B Operate and monitor machine/process

Application

This unit of competency defines the skills and knowledge required to operate and monitor a machine and process and applies to a range of production operations or continuous processes.

The work is performed in accordance with clear step-by-step instructions and procedures documented on job sheets or similar process instruction documents.

Operational adjustments to the machine or process by the operator are made using external controls. Basic operation (excluding setting and tool adjustments) of computer numerically controlled (CNC) machines is also covered by this unit.

Where operational maintenance is required to be performed unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where production packaging and labelling of the finished goods or product is required unit MEM11006 Perform production packaging should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

This unit should not be selected with any of the following units unless the skills of this unit are being applied to an additional and different type of machine and or process:

- MEM04001 Operate melting furnaces
- MEM04002 Perform gravity die casting
- MEM04003 Operate pressure die casting machine
- MEM04006 Operate sand moulding and core making machines

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- MEM06001 Perform hand forging
- MEM06002 Perform hammer forging
- MEM08001 Perform wire, jig and barrel load/unload work
- MEM08004 Finish work using wet, dry and vapour deposition methods
- MEM08008 Operate and control surface finishing waste treatment process

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Conduct pre-start checks**	2.1	Undertake pre-start checks to SOPs
		2.2	Observe safety procedures and check all safety equipment for correct operation
3	**Operate machine/process**	3.1	Start up machine or process in accordance with SOPs
		3.2	Operate machine or process in accordance with job instructions
		3.3	Load components/feed stock and maintain consistent with production requirements
		3.4	Unload machine or process
		3.5	Handle machine or process output and store in a manner not likely to cause damage
		3.6	Record production data to SOPs
4	**Monitor machine/process**	4.1	Monitor machine or process for safe and correct operation
		4.2	Identify deviations and faults and report in accordance with procedures
		4.3	Follow emergency procedures in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machine/process uses include one (1) or more of the following:	• pressing • punching • plastic moulding • extruding • bending • joining • rolling • forming • drawing • metal removal • pickling • cylinder filling • printing • painting
Production data includes one (1) or more of the following:	• production schedules • job sheets • checklists

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07024B Operate and monitor machine/process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07024 Operate and monitor machine and process

Modification History

Release 1. Supersedes and is equivalent to MEM07024B Operate and monitor machine/process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting machine/process instruction and setting up for production
- conducting pre-start checks
- operating the machine or process, loading and unloading in accordance with procedures
- following emergency procedures, as required
- completing production data onto applicable workplace forms
- monitoring the machine or process, identifying any faults or out-of-specification operation and reporting, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of Personal Protective Equipment (PPE)
- machine pre-start checks
- machine or process start-up and unloading procedures
- component/feed stock levels to ensure continuous process
- production recording and reporting requirements
- types of product faults and deviations
- consequences of improper handling and storing of finished work
- procedures to be followed in emergency situations.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating and monitoring machine and process at least to the level being assessed with relevant industry knowledge and experience

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    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07025 Perform advanced machine and process operation

Modification History

Release 1. Supersedes and is equivalent to MEM07025B Perform advanced machine or process operation

Application

This unit of competency defines the skills and knowledge required to perform advanced operation and monitor a machine or process recognising and rectifying deviations and faults.

It relates to where the output of the machine or process can be varied at the discretion of the operator and where recognition/rectification skills are applied based upon product/material/process knowledge to achieve specified outcomes.

Where operational maintenance is required to be performed unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

Where diagnosis and rectification of advanced plastic processes is required unit MEM07026 Perform advanced plastic processing should also be selected.

Where diagnosis and rectification of advanced press operations is required unit MEM07027 Perform advanced press operations should also be selected.

When production packaging and labelling of the finished goods or product is required unit MEM11006 Perform production packaging should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

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Pre-requisite Unit

MEM07024	Operate and monitor machine and process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions, including machine or process selection and settings
2	**Conduct pre-start checks**	2.1	Check safety equipment and guards for correct position and operation
		2.2	Undertake programmed operational maintenance according to procedures
		2.3	Undertake pre-start checks to SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.4	Verify equipment, raw material and tooling to match task requirement
3	**Operate machine or process**	3.1	Start up machine or process in accordance with SOPs
		3.2	Operate machine or process in accordance with job instructions
		3.3	Load components/feed stock and maintain consistent with production requirements
		3.4	Unload machine or process output using appropriate manual handling techniques
		3.5	Handle machine or process output and store in a manner not likely to cause damage
		3.6	Record production data to SOPs
4	**Monitor machine or process**	4.1	Monitor machine or process for safe and correct operation
		4.2	Follow emergency procedures in accordance with SOPs
5	**Recognise and rectify deviations and faults in raw material, product, process and equipment**	5.1	Recognise faults/deviations from standard operating procedures, job sheets or other documentation
		5.2	Rectify faults/deviations in accordance with SOPs, job sheets or other documentation
		5.3	Adjust machine or process settings within parameters, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machine/process uses include one (1) or more of the following:	• pressing • punching • plastic moulding • extruding • bending • joining • rolling • forming • drawing • metal removal • pickling • cylinder filling • printing • painting
Faults/deviations include one (1) or more of the following:	• product/output • machine • raw material or feed stock • tooling • process equipment • process

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07025B Perform advanced machine or process operation

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07025 Perform advanced machine and process operation

Modification History

Release 1. Supersedes and is equivalent to MEM07025B Perform advanced machine or process operation

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and other applicable reference documents in performing advanced machine and process operations
- undertaking pre-start checks of a machine or process
- undertaking appropriate manual handling in loading, unloading and storing of finished work without damage
- operating a machine or process and determining required adjustments to process
- recording production data in accordance with standard operating procedures
- identifying and rectifying faults/deviations in raw material, product, process and equipment from specifications, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- machine and process documentation requirements including production recording and reporting requirements
- required pre-start checks of a machine or process
- machine or process start-up and unloading procedures
- reasons and procedures for programmed operational maintenance
- necessary component/feed stock levels to ensure continuous process
- types of raw material, product, process and equipment fault/deviations and corrective actions
- procedures to be followed in emergency situations
- consequences of improper handling and storing of finished work.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced machine and process operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07026 Perform advanced plastic processing

Modification History

Release 1. Supersedes and is equivalent to MEM07026B Perform advanced plastic processing

Application

This unit of competency defines the skills and knowledge required to produce products using advanced plastic processing equipment.

It relates to operations where the output of the machine or process can be varied at the discretion of the operator and where recognition/rectification skills are applied based upon product/material/process knowledge to achieve specified outcomes.

Where operational maintenance is required to be performed unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

When production packaging and labelling of the finished goods or product is required unit MEM11006 Perform production packaging should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM07024	Operate and monitor machine and process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions, including machine or process selection and settings
2	**Conduct pre-start checks**	2.1	Check safety equipment and guards for correct position and operation
		2.2	Undertake programmed operational maintenance according to procedures
		2.3	Undertake pre-start checks to SOPs
		2.4	Verify the match of task requirements against equipment, raw material and tooling
3	**Operate machine or process**	3.1	Start up machine or process in accordance with SOPs
		3.2	Operate machine or process in accordance with job instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Load components/feed stock and maintain consistent with production requirements
		3.4	Unload machine or process output using appropriate manual handling techniques
		3.5	Handle machine or process output and store in a manner not likely to cause damage
		3.6	Record production data to SOPs
4	**Monitor machine or process**	4.1	Monitor machine or process for safe and correct operation
		4.2	Follow emergency procedures in accordance with SOPs
5	**Recognise and rectify deviations and faults in product/output, raw material/feed stock, tooling and machine or process**	5.1	Recognise faults/deviations from standard operating procedures, job sheets or other documentation
		5.2	Rectify faults/deviations in accordance with SOPs, job sheets or other documentation
		5.3	Adjust machine or process settings within parameters, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Plastic and rubber processing include one (1) or more of the following:	• injection • blow moulding • processing of fibre reinforced composites • extrusion • thermoforming • vacuum forming • foaming
Product faults/deviations include one (1) or more of the following:	• short shots • warped mouldings • dimensional errors
Raw materials faults/deviations include one (1) or more of the following:	• contamination • colour variation
Tooling faults/deviations include one (1) or more of the following:	• blemishes • missing detail
Machine or process faults/deviations include one (1) or more of the following:	• short shots • burn marks • distortion

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07026B Perform advanced plastic processing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07026 Perform advanced plastic processing

Modification History

Release 1. Supersedes and is equivalent to MEM07026B Perform advanced plastic processing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other workplace documents in performing advanced plastic processing
- undertaking pre-start checks of a machine or process, including checking of safety equipment and guards
- undertaking appropriate manual handling in loading, unloading and storing of finished work without damage
- operating a machine or process and determining required adjustments to process
- recording production data in accordance with SOPs
- identifying and rectifying faults/deviations in product, raw materials, tooling and machine/process.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- safety features of the machine or process equipment being operated
- programmed operational maintenance requirements of the machine or process
- pre-start checks and start-up/shutdown procedures
- operating procedures for plastic processing machinery and equipment
- unloading procedures for plastics processing and procedures for handling and storing finished work
- consequences of improper handling and storing
- recording requirements for plastic processing operations
- emergency procedures
- plastic product fault/deviations and corrective action to rectify types of product fault/deviations, raw material faults/deviations and tooling faults/deviations

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- deviations and faults in machine or process and the correct action to rectify machine or process faults/deviations.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced plastic processing at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07027 Perform advanced press operations

Modification History

Release 1. Supersedes and is equivalent to MEM07027B Perform advanced press operations

Application

This unit of competency defines the skills and knowledge required to perform advanced press operations and relates to operations where the output of the machine/process can be varied at the discretion of the operator and where recognition/rectification skills are applied based upon product/material/process knowledge to achieve specified outcomes.

Where operational maintenance is required to be performed unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

When production packaging and labelling of the finished goods or product is required unit MEM11006 Perform production packaging should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM07024	Operate and monitor machine and process
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions, including machine or process selection and settings
2	**Conduct pre-start checks**	2.1	Check safety equipment and guards for correct position and operation
		2.2	Undertake programmed operational maintenance according procedures
		2.3	Undertake pre-start checks to SOPs
		2.4	Verify the match task requirements against equipment, raw material and tooling
3	**Operate machine/ process**	3.1	Start up and operate machine/process in accordance with job instructions and SOPs
		3.2	Load components/feed stock and maintain consistent with production requirements
		3.3	Unload machine/process output using appropriate manual handling techniques

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Handle machine/process output and store in a manner not likely to cause damage
		3.5	Record production data to SOPs
4	**Monitor machine/process**	4.1	Monitor machine/process for safe and correct operation
		4.2	Follow emergency procedures in accordance with SOPs
5	**Recognise and rectify deviations and faults in product/output, raw material/feed stock, tooling and machine/ process**	5.1	Recognise faults/deviations from SOPs, job sheets or other documentation
		5.2	Rectify faults/deviations in accordance with standard operating procedures, job sheets or other documentation
		5.3	Adjust machine/process settings within parameters, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Metal working press operations include one (1) or more of the following:	• drawing • blanking • bending • coining • sizing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

- extruding
- forming and shaping

Faults/deviations include one (1) or more of the following:

- splits
- warping
- deformation
- dimensional errors
- gauge variation
- hardness
- colour variation
- marks
- missing detail
- distortion

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07027B Perform advanced press operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07027 Perform advanced press operations

Modification History

Release 1. Supersedes and is equivalent to MEM07027B Perform advanced press operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other workplace documents in performing advanced press operations
- undertaking pre-start checks of a machine or process, including checking of safety equipment and guards
- undertaking appropriate manual handling in loading, unloading and storing of finished work without damage
- operating press machine or process and determining required adjustments to process
- recording production data in accordance with SOPs
- identifying and rectifying faults/deviations in product, raw materials, tooling and machine/process.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics and properties of materials used in pressing operations and consequences of selecting incorrect processes for nominated materials
- documentation, production recording and reporting requirements for press operations
- pre-start checks and press machine/process start-up and unloading procedures
- types of product, process, tooling and machine faults/deviations and corrective actions
- procedures to be followed in emergency situations
- consequences of improper handling and storing of finished work
- component/feed stock levels to ensure continuous process
- programmed operational maintenance requirements.

Assessment Conditions

- Assessors must:

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  - have vocational competency in performing advanced press operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07028 Operate computer controlled machines and processes

Modification History

Release 1. Supersedes and is equivalent to MEM07028B Operate computer controlled machines/processes

Application

This unit of competency defines the skills and knowledge required to operate and monitor a range of numerically controlled (NC), computer numerically controlled (CNC) and robot operated machines or processes in a production environment.

Technical difficulties are resolved in consultation with appropriate technical advisers.

Where operational maintenance is required to be performed unit MEM07001 Perform operational maintenance of machines/equipment should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM07024	Operate and monitor machine and process
MEM11011	Undertake manual handling

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Conduct pre-start checks**	2.1	Undertake pre-start checks to SOPs
		2.2	Check all safety equipment for correct operation
3	**Operate computer controlled machine/process**	3.1	Select installed computer controlled program and verify in accordance with job instructions
		3.2	Operate computer controlled machine to product specifications
		3.3	Identify and report machine malfunctions
		3.4	Check production samples for compliance to specification
4	**Monitor**	4.1	Monitor tool wear and, where appropriate, replace pre-set

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
machine/process	tools and identify tool offsets in computer controlled program and adjust, or take other corrective action according to procedures
	4.2 Report product deviation from specification in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07028B Operate computer controlled machines/processes

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07028 Operate computer controlled machines and processes

Modification History

Release 1. Supersedes and is equivalent to MEM07028B Operate computer controlled machines/processes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents for computer controlled machine and process operations
- safely undertaking pre-start checks of the machine/process
- selecting appropriate program for the specified work and operating the machine, identifying any malfunctions and checking completed work to ensure it meets specifications
- monitoring the machine or process operation, adjusting and rectifying any tooling settings, as required
- reporting malfunctions or out-of-specification operation, where necessary.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pre-start checks for machines and process
- safety equipment, features and procedures associated with the machine or process
- procedures for accessing and verifying computer controlled programs installed in the machine controller
- computer controlled machine operating procedures
- typical machine malfunctions and procedures for reporting
- measuring instruments/techniques
- examples of tool wear and the effect on product or part specifications and procedures to be followed once tool wear has been detected
- techniques for replacing pre-set tools
- adjustments to tool offsets and the effect of adjustments on part or product specifications
- procedures for reporting product or part deviations.

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Assessment Conditions

- Assessors must:
  - have vocational competency in operating computer controlled machines and processes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07029 Perform routine sharpening and maintenance of production tools and cutters

Modification History

Release 1. Supersedes and is equivalent to MEM07029B Perform routine sharpening/maintenance of production tools and cutters

Application

This unit of competency defines the skills and knowledge required to prepare, grind, check and reassemble production tooling and applies to the routine sharpening and maintenance of production tools/cutters in a production machining environment.

Where machine setting is required unit MEM07003 Perform routine machine setting should also be selected.

Where more advanced tool and cutter grinding operations is required unit MEM07010 Perform tool and cutter grinding operations should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

This unit should not be selected when unit MEM07010 Perform tool and cutter grinding operations has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011 Undertake manual handling

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MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare for tool and cutter grinding**	2.1	Disassemble production tooling, as required to facilitate sharpening in accordance with SOPs
		2.2	Select tool and cutter grinding wheels, balance and dress in accordance with job instructions
		2.3	Mount fixtures or locating tools/cutters to be sharpened in accordance with procedures
3	**Set up machine and perform tool and cutter grinding**	3.1	Mount tools and cutters to be sharpened in predetermined fixtures
		3.2	Sharpen tools and cutters in accordance with defined procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Check tools/cutters for conformance to specification**	4.1 Inspect, check and measure tools/cutters for conformance to specifications
	4.2 Inspect, check and measure assembled tooling for conformance to specifications
	4.3 Reassemble production tooling and install inserts in accordance with job instructions

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Production tooling includes one (1) or more of the following:	• inserted boring bars • face cutters • gear cutters • grinding machines and accessories
Grinding wheel properties include one (1) or more of the following:	• cup, dish and diamond • grain size of abrasive particles • grade or strength of bond • structure of grain spacing
Fixtures/equipment include one (1) or more of the following:	• clamps • vices • magnetic chucks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

- indicator pawls

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07029B Perform routine sharpening/maintenance of production tools and cutters

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07029 Perform routine sharpening and maintenance of production tools and cutters

Modification History

Release 1. Supersedes and is equivalent to MEM07029B Perform routine sharpening/maintenance of production tools and cutters

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting tool and cutter sharpening and maintenance job instructions
- selecting and mounting appropriate grinding equipment and cutters to perform the sharpening task
- undertaking the sharpening and maintenance of tools and cutters checking that the finished work meets specifications
- reassembling the sharpened/maintained tooling and inspecting for conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence of tooling sharpening and maintenance operations to be performed
- function of coolant and dust extraction devices
- standard grinding wheel shapes
- range of abrasive materials used in grinding wheels
- effect of the following grinding wheel features on wheel selection and application:
  - grain size of abrasive particles
  - grade or strength of bond material
  - structure of grain spacing and dressing processes
- function and application of grinding accessories used for routine sharpening of production tools and cutters
- preparation requirements for tool maintenance
- requirements for checking:
  - dimensions and tolerances
  - geometry and tolerances

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- surface finish specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing routine sharpening and maintenance of production tools and cutters at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07030 Perform basic metal spinning lathe operations

Modification History

Release 1. Supersedes and is equivalent to MEM07030C Perform metal spinning lathe operations (basic)

Application

This unit of competency defines the skills and knowledge required to perform basic metal spinning lathe (excluding computer numerically controlled [CNC]) operations.

It applies to manual metal spinning of sheet metals of varying thicknesses but does not include hot spinning procedures. Tool use will include either hand and/or slide tooling of varying design and materials.

Where annealing is required unit MEM05007 Perform manual heating and thermal cutting should also be selected.

Where disc blanks are required to be cut out using a dedicated circle cutter or similar unit MEM07032 Use workshop machines for basic operations should also be selected.

Where operational maintenance requires dismantling and replacing components unit MEM18055 Dismantle, replace and assemble engineering components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Perform spinning operations**	2.1	Select tools to produce components to specifications
		2.2	Determine disc size in accordance with procedures
		2.3	Calculate spinning speeds for various metals and metal thicknesses using appropriate mathematical techniques and reference materials
		2.4	Select correct back centre and form chucks and mount in accordance with procedures and specifications
		2.5	Mount prepared disc for forming
		2.6	Perform spinning operations using a full range of spinning accessories

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.7	Carry out routine maintenance
3 **Check components for conformance to specifications, remove and store them**	3.1	Check components for conformance to specifications using appropriate techniques, tools and equipment
	3.2	Make adjustments, as required
	3.3	Remove components from the spinning lathe without marking or any deformation
	3.4	Store components and package to avoid oxidation and damage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tools include one (1) or more of the following:	• spinning tools • planishing tools • backstick • trimming • beading tools
Spinning accessories include one (1) or more of the following:	• back centre • various chucks • trimming accessories • blank centre equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

	• tee-rest
Metals include one (1) or more of the following:	• steel • aluminium • monel • copper • brass • zinc • pewter • silver • gold • tin
Spinning operations include one (1) or more of the following:	• spinning • beading • trimming • finishing • annealing • pickling
Maintenance and adjustments include the following:	• cleaning and lubrication

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07030C Perform metal spinning lathe operations (basic)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07030 Perform basic metal spinning lathe operations

Modification History

Release 1. Supersedes and is equivalent to MEM07030C Perform metal spinning lathe operations (basic)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and other applicable reference documents for spinning lathe operations
- calculating disc size and spinning speeds
- selecting chucks and mounting disc for forming
- performing spinning operation using appropriate accessories to produce finished work that meets specifications
- removing finished work and storing to minimise damage
- performing operational maintenance on the lathe and related equipment and making any required adjustments to lubrication levels.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- correct sequence of spinning operation
- types of spinning tools, their functions and requirements for maintaining tools
- types of damage and defects (e.g. tool marks, cracking, stress marks, thinning and incorrect finish)
- spinning lathe operation
- why and how lathe speed is calculated
- reasons for types of form chuck mounting
- function and operation of accessories for basic spinning and methods used for each process
- correct methods for stacking and protecting finished product.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing basic metal spinning lathe operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07031 Perform complex metal spinning lathe operations

Modification History

Release 1. Supersedes and is equivalent to MEM07031C Perform metal spinning lathe operations (complex)

Application

This unit of competency defines the skills and knowledge required to perform complex metal spinning operations (excluding computer numerically controlled [CNC]) operations, using advanced processes, spinning tools and accessories.

Where there is a requirement to join spun materials or products in addition to, or instead of, (the spinning operation of) swaging, the following units should also be selected as appropriate:

- MEM05003 Perform soft soldering
- MEM05006 Perform brazing and/or silver soldering; or
- MEM05004 Perform routine oxy fuel gas welding; or
- MEM05012 Perform routine manual metal arc welding

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Ba**nd: A**

Unit Weight: 4

Pre-requisite Unit

MEM07030	Perform basic metal spinning lathe operations
MEM07032	Use workshop machines for basic operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare form chucks for spinning**	2.1	Select tools to produce components to specifications
		2.2	Determine disc and cut to the correct size and tolerance in accordance with procedures
		2.3	Set up metal turning lathe for machining form chucks according to standards and SOPs
		2.4	Prepare form chuck for general spinning as per drawings and specifications
		2.5	Prepare form chuck for seaming/swaging joints as per drawings and specifications
3	**Perform complex spinning**	3.1	Calculate spinning speeds for various metals and metal thicknesses using appropriate mathematical techniques

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	operations		and reference materials
		3.2	Select correct back centre and form chucks and mount according to procedures and specifications
		3.3	Mount prepared disc for forming
		3.4	Perform complex spinning operations using accessories required to achieve the specified outcome
4	**Check components for conformance to specifications**	4.1	Check spun components for conformance to specifications using appropriate techniques, tools and equipment
		4.2	Rectify non-compliant spun components in accordance with SOPs
5	**Remove and store components**	5.1	Remove components from the spinning lathe without marking or any deformation
		5.2	Store components and package to avoid oxidation and damage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Tools include one (1) or	• spinning tools

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

more of the following:	• planishing tools • backstick • trimming • beading tools • back centre • holding and sectional chucks • tee-rest • compound and additional slides • recessed and cranked followers • rollers and knurling wheels
Complex spinning operations include one (1) or more of the following:	• spinning • beading • recessing • oval spinning • screw forming • (thread spinning) seaming • swaging • trimming finishing • annealing • pickling • combined angles • multi-radii
Metals include one (1) more of the following:	• steels • aluminium • monel • copper • brass • brass alloys • zinc, pewter • silver • gold • tin

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07031C Perform metal spinning lathe operations (complex)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07031 Perform complex metal spinning lathe operations

Modification History

Release 1. Supersedes and is equivalent to MEM07031C Perform metal spinning lathe operations (complex)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and other applicable reference documents for performing complex spinning lathe operations
- calculating disc size and lathe speed including angles and radius
- selecting chucks and mounting disc for forming
- coordinating the use of multi-slides and tools, feeds and speeds
- performing complex spinning operation using a range of accessories to produce finished work that meets specifications
- removing finished work and storing to minimise damage
- performing operational maintenance on the lathe and related equipment and making any required adjustments to lubrication levels.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- complex spinning operations, processes and techniques
- requirements for maintaining lathe spinning tools and manufacturing form chucks
- types of damage and defects including tool marks, cracking, stress marks, thinning and incorrect finish
- function and operation of lathe accessories
- methods used for complex spinning processes
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components
- methods for stacking and protecting finished product.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing complex metal spinning lathe operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM07032 Use workshop machines for basic operations

Modification History

Release 1. Supersedes and is equivalent to MEM07032B Use workshop machines for basic operations

Application

This unit of competency defines the skills and knowledge required to use workshop machines for basic operations in maintenance or jobbing environment.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Set up machine**	2.1	Select appropriate machine and tools to meet work requirements
		2.2	Sharpen cutting tools, as required
		2.3	Install tools according to procedures
		2.4	Set guards and adjust, as required
3	**Operate machine**	3.1	Mount material to be machined and secure using clamping device/ appropriate to the material and work requirements
		3.2	Operate machine to suit work and material requirements
		3.3	Check machined component against work requirements and predetermined finish
		3.4	Make adjustments, as required

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Machines include one (1) or more of the following:	• lathe • radial arm drill • mill
Cutting tools include one (1) or more of the following:	• lathe tools • milling cutters • drills
Materials include one (1) or more of the following:	• ferrous • non-ferrous
Clamping devices include one (1) or more of the following:	• chucks • vices • clamps • bars and packing

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07032B Use workshop machines for basic operations

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Assessment Requirements for MEM07032 Use workshop machines for basic operations

Modification History

Release 1. Supersedes and is equivalent to MEM07032B Use workshop machines for basic operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and work instructions for machine operations
- setting up machines and selecting, sharpening and mounting tools required for the required job
- mounting the material to be processed and safely operating the machine
- checking machined components to ensure it meets specifications and making adjustments, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cutting tool sharpening methods and techniques
- units of measurement, tool geometry and numerical operations required for basic machining operations
- safe operation of tool sharpening equipment and consequences of incorrect sharpening
- machine set-up and consequences of incorrect speeds and feeds
- procedures for operating workshop machines
- reasons for poor surface finish.

Assessment Conditions

- Assessors must:
  - have vocational competency in using workshop machines for basic operations at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07033 Operate and monitor basic boiler

Modification History

Release 1. Supersedes and is equivalent to MEM07033B Operate and monitor basic boiler

Application

This unit of competency defines the skills and knowledge required to perform start-up, take-over/handover, monitor, shutdown and storage of a basic boiler used for all purposes, including the generation of steam.

All work is carried out to applicable state/territory and national work health and safety (WHS) legislation, standards and codes of practice.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Machine and process operations

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Carry out pre-operational checks**	2.1	Undertake pre-operational checks of boiler to plant operating procedures
		2.2	Identify maintenance requirements and report in accordance with procedures
3	**Maintain health and safety standards in work area**	3.1	Identify hazards and potential hazards and report according to SOPs
		3.2	Select hazard prevention/control measures, as required
4	**Start boiler and conduct hand-over/take-over procedures**	4.1	Start boiler and bring online safely, consistent with workplace procedures and production requirements
		4.2	Confirm operating status of boiler
		4.3	Maintain operating log and communicate boiler status/operation according to workplace procedures
5	**Operate, monitor and shut down boiler**	5.1	Operate boiler and monitor consistent with production and safety requirements
		5.2	Conduct boiler water quality tests and adjust boiler water quality to manufacturers' recommendations and workplace procedures, as required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		5.3	Act upon boiler failures/emergencies according to workplace procedures and notify downstream users, if necessary
		5.4	Shut down boiler consistent with workplace procedures, production and safety requirements
6	**Carry out boiler shutdown for an internal inspection**	6.1	Shut down boiler for internal inspection
		6.2	Clean boiler internally and externally to manufacturers' recommendations and workplace procedures
7	**Store boiler in shutdown mode**	7.1	Identify manufacturers' recommendations and workplace procedures required for shutdown storage mode
		7.2	Store boiler in identified shutdown mode

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Pre-operational checks include one or more of the following:

- feed water supply
- boiler water level
- fuel supply/heat source
- boiler valves - their operation and position
- combustion air supply
- combustion equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Boilers include the following:	• single fixed combustion air supply, non-modulating single heat source and fixed firing rate
Hazards include one (1) or more of the following:	• chemical • thermal • manual handling • guarding of machinery • illumination of work area • rubbish and combustibles • leakage of steam and fuel
Monitor includes one (1) or more of the following:	• steam pressure • flame and combustion conditions • feed system and condensate returns • fuel system • water level • combustion management system • water management system • boiler and steam manifold fittings • soot blowers
Handover includes the following:	• previous load requirements • maintenance issue, including equipment isolated for maintenance • operational incidences • completing/reading operating log • general inspection of boiler to detect any defects • accept responsibility of boiler • noted equipment malfunctions • required equipment tests
Storage mode includes one (1) or more of the following:	• wet • dry • open condition • closed condition

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07033B Operate and monitor basic boiler

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07033 Operate and monitor basic boiler

Modification History

Release 1. Supersedes and is equivalent to MEM07033B Operate and monitor basic boiler

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- safely conducting pre-operational checks of the boiler and reporting any faults or hazards
- starting and bringing the boiler online and confirming its operating status
- monitoring the boiler operation and conducting water quality tests, as required
- reacting effectively to any boiler emergency situations
- shutting down the boiler in the required condition, cleaning and putting into storage mode.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pre-operational checks, including:
  - feed water supply
  - boiler water level
  - fuel supply/heat source
  - boiler valves their operation and position
  - combustion air supply
  - combustion equipment
- procedures for identifying and reporting maintenance
- statutory requirements and workplace procedures for identifying and reporting hazards in the work area
- processes for starting a boiler, including:
  - heat input
  - warm up of the reticulation system
  - steam traps and steam line purge
  - systems operation
  - reticulation line pressure

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  - steam usage
  - supply
- processes for confirming operational status of boiler
- procedures for maintaining boiler operating log
- procedures for communicating boiler status and operation
- principles of boiler operation
- boiler fittings
- preparing boiler for inspection
- procedures for monitoring a boiler, including:
  - steam reticulation line pressure
  - usage, supply and quality of steam
  - combustion/heat source system
  - feed water system
  - fuel system combustion air supply
  - water level
  - boiler steam pressures
- operation of boiler control/safety devices
- location of inspection and explosion doors
- procedures for conducting boiler water quality tests
- feed water systems and treatment
- emergency procedures, including:
  - identification of emergency
  - isolation of heat source
  - selection and application of appropriate fire-fighting equipment
  - notification of downstream users
- processes and procedures, including:
  - confirming water level
  - cooling down
  - boiler pressure/vacuum
  - fuel/heat source isolation
  - removal of combustion equipment and water from boiler
  - isolation from any common connection
  - the opening of all access points required for inspection
- procedures for cleaning the boiler internally and externally
- various modes of boiler storage
- procedures for storing the boiler in open or closed condition.

Assessment Conditions

- Assessors must:

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  - have vocational competency in operating and monitoring a basic boiler at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07039 Write programs for industrial robots

Modification History

Release 1. Supersedes and is equivalent to MEM07039A Write programs for industrial robots

Application

This unit of competency defines the skills and knowledge required to plan and write computer programs for robot operations to achieve operating specifications. Programs are in accordance with manufacturers' operating procedures, manufacturer specific language and the functional parameters of the robot.

Where setting of robot cells is required unit MEM07040 Set multistage integrated processes should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10004	Enter and change programmable controller operational parameters
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Machine and process operations

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify robot requirements**	2.1	Identify robot features and specifications
		2.2	Identify robot language appropriate to the robot type
		2.3	Identify robot safety features
		2.4	Interpret manufacturers' operating procedures and engineering drawings to define robot function and tool path geometry
		2.5	Determine required operations for robot and end effectors in conjunction with appropriate technical experts or other technical reference sources
3	**Plan robot program**	3.1	Identify programming requirements
		3.2	Calculate coordinates for tool path or robot functions
		3.3	Select programming method
		3.4	Develop program plan
4	**Write basic program**	4.1	Prepare robot and computer equipment
		4.2	Write program in required language and in accordance with SOPs
		4.3	Incorporate safety features in robot program

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.4 Prepare operation sheet
5 **Trial program**	5.1 Trial program by operating robot in manual mode in conjunction with operator, as appropriate
	5.2 Verify program performance against required specifications and with appropriate technical experts or other technical reference sources
	5.3 Edit program if necessary to adjust operation, as required
	5.4 Check components for conformance to specifications, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Features and specifications include one (1) or more of the following:

- components
- capabilities
- speed
- reach
- load carrying capacity
- accuracy/repeatability
- classification
- polar coordinate
- cylindrical coordinate
- Cartesian coordinate

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

- jointed elbow
- SCARA
- movements
- base
- shoulder
- elbow
- pitch
- roll
- yaw
- applications
- required operating conditions
- limitations
- justification
- safety features

Language includes the following:

- language appropriate to robot type

Safety features include one (1) or more of the following:

- AS 2939-1987 Industrial robot safety - Safe design and usage
- physical design
- enclosures
- layout
- programming
- sensing
- personnel

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07039A Write programs for industrial robots

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07039 Write programs for industrial robots

Modification History

Release 1. Supersedes and is equivalent to MEM07039A Write programs for industrial robots

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, engineering drawings and other applicable reference documents to write programs for industrial robots
- identifying required robot operations in determining programming requirements
- planning the programming methodology appropriate to the robot type and operation
- calculating coordinates of all relevant points on the part or product to be produced
- writing the robot program in the correct programming language and drafting a robot operation sheet
- trialling the program ensuring the robot operates safely and correctly and produces work that meets specification
- editing the program as necessary to ensure compliance with specifications
- undertaking program storage and filing procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- classifications/applications of industrial robots, including:
  - welding
  - thermal cutting
  - machining
  - forming and shaping
  - pick and place
  - palletising
  - machine loading/unloading
- end effectors, including:
  - grippers

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  - tools and tool changes
- features and specifications of robots and components
- joint movements of a robot
- drive systems used to generate robot movement
- robot programming methods and procedures
- function of elements in controlling operation of a robot
- safety features and requirements of robots
- type(s) of robots and end effectors and their applications
- robot operations controlled by programs
- tool path(s) when producing a part or product
- sequence of robot operations, including movements
- zero point of the robot
- standard codes and languages for robot programs
- procedures for completing robot operation sheets
- procedures for manual operation of the robot
- reasons for testing and proving the robot program
- procedures for editing the robot program
- effects of editing on the operation of the robot and the part or product to be produced
- measuring equipment/techniques used to check for conformance to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in writing programs for industrial robots at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07040 Set multistage integrated processes

Modification History

Release 1. Supersedes and is equivalent to MEM07040A Set multistage integrated processes

Application

This unit of competency defines the skills and knowledge required to set, according to defined procedures, a wide range of continuous process lines and processes, where operations are performed by machines and equipment that are sequentially linked and involves process lines and robot cells.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where setting or adjustment of numerical control (NC) and computer numerical control (CNC) or programmable logic control (PLC) is required appropriate units should also be selected.

Where robot operation, editing and/or programming skills is required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM16008	Interact with computing technology
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Set process line**	2.1	Use tools and equipment in a safe manner according to SOPs
		2.2	Set up process line to specifications in accordance with SOPs
		2.3	Set up all sensors, process links, displays, monitors and feedback loops to specifications
		2.4	Check all safety apparatus for correct position and operation
		2.5	Run process line to meet predetermined production and quality requirements
		2.6	Adjust process line to meet specifications and operational requirements, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	2.7 Instruct operator(s), as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Processes include one (1) or more of the following:	• mechanical assembly operations and processes
	• electrical/electronic assembly operations and processes, such as:
	  • welding
	  • testing
	  • insertion
	  • filling
	  • printing
	  • hot stamping

Safety apparatus includes one (1) or more of the following:	• guards • PPE • emergency switches

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07040A Set multistage integrated processes

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07040 Set multistage integrated processes

Modification History

Release 1. Supersedes and is equivalent to MEM07040A Set multistage integrated processes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and other applicable reference documents relating to setting multistage continuous process lines
- using appropriate hand tools and equipment
- setting the process line and trialling to ensure it operates safely and to specifications, adjusting as required
- entering routine and familiar information onto proformas and standard workplace forms
- instructing process line operators on correct operational procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- communication strategies for giving clear instruction to process line operators
- specifications and sequencing that apply to given process lines
- interpretation of feedback from machine process
- specifications applicable to the sensors, process links, displays, monitors and feedback loops incorporated in the process line
- correct operation and specification for all safety apparatus incorporated in the process line
- product specifications and quality and production requirements
- effect of process line adjustments on product and operational specifications
- process line operator procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in setting multistage integrated processes at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07041 Perform production machining

Modification History

Release 1. Supersedes and is equivalent to MEM07041A Perform production machining

Application

This unit of competency defines the skills and knowledge required to perform production machining using engineering machinery.

Production machining refers to use of workshop machines for volume production of parts or components made of metal or other machinable materials where the machine operator has responsibility for the setting up of the machine, including tooling, grinding wheels, and other accessories within defined parameters. It does not include one-off jobbing on workshop machines or complex calculations. Tolerances and tool paths will normally have been set in advance.

Where trade machining applications are undertaken unit MEM07005 Perform general machining should be selected.

Where set up and operation of electro-discharge machines (EDM) is required unit MEM07014 Perform electro-discharge machining (EDM) operations should also be selected.

Where machining is undertaken without the need for any set up, including mounting of tools, setting of speeds, feeds and other operational parameters then unit MEM07024 Operate and monitor machine and process and unit MEM07025 Perform advanced machine and process operation, should also be selected as appropriate.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

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Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Follow required sequence of operations**	2.1	Confirm number of items to be produced
		2.2	Plan the operation for required run rate, efficiency and minimisation of waste
		2.3	Select correct material for operation from pre-determined stock range
		2.4	Establish starting point on stock for operation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.5	Maintain process and quality logs
3	**Select and mount tools**	3.1	Select appropriate tooling from pre-selected range
		3.2	Select appropriate stock and grind to required tool shape using pre-set jigs and fixtures to achieve pre-determined angles and clearances
		3.3	Monitor tooling and sharpen tools and drills to pre-determined specifications, as required
4	**Perform production machining operations**	4.1	Use basic marking out techniques to pre-determined specifications on stock or components
		4.2	Set machining parameters for job requirements
		4.3	Monitor tool or cutter performance life
		4.4	Clamp or hold work without damage to product and ensuring all safety requirements are met
		4.5	Perform machining utilising all guards and safety procedures
5	**Perform production grinding operations**	5.1	Select appropriate grinding wheel for required operation from pre-selected options
		5.2	Mount and tighten grinding wheels to required sequence and specification
		5.3	Dress and true grinding wheel using given range of dressing tools
		5.4	Check grinding wheel for balance and safety
		5.5	Adjust coolant flow and position
		5.6	Undertake grinding operation utilising all guards and safety procedures
		5.7	Monitor grinding wheel performance and life according

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			to SOP
6	**Measure components**	6.1	Select instruments or gauges appropriate to the measurement requirements
		6.2	Check machined or ground items for compliance with specifications
		6.3	Identify out-of-specification items and check if settings or tooling require adjustment
7	**Adjust and maintain machine**	7.1	Carry out routine maintenance and adjustments, as required
		7.2	Report and log malfunctions according to enterprise procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Operations include one (1) or more of the following:	• parallel cutting • slotting • drilling • knurling • cutting flats • centred and centreless grinding operations

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• ferrous • non-ferrous metals • other machinable materials
Tooling includes one (1) or more of the following:	• carbide • ceramic and high speed steel machine tooling • cutting tool accessories • holding devices
Measuring devices include one (1) or more of the following:	• rulers • gauges • verniers and micrometres (digital or analogue)
Basic marking out techniques include using one (1) or more of the following:	• calipers • steel rules • dividers and scribers
Machining parameters include one (1) or more of the following:	• speeds • feeds • stops • coolant and cutting lubricants
Machines include one (1) or more of the following:	• lathes • mills • planers • shapers • radial and pedestal drills • slotters • grinders
Maintenance and adjustments include one (1) or more of the	• slide and collar adjustment • cleaning and lubrication

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

following:

Types and features of industrial grinding wheels include one (1) or more of the following:	• wheel make-up • wheel hubs • wheel classification • types of grits and bonds
Dressing tools include one (1) or more of the following:	• industrial diamond • dressing wheels • dressing sticks
Balancing of grinding wheels includes the following:	• checks and identification for balance only

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07041A Perform production machining

Links

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Assessment Requirements for MEM07041 Perform production machining

Modification History

Release 1. Supersedes and is equivalent to MEM07041A Perform production machining

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and other applicable reference documents to perform production machining
- selecting appropriate tooling, measuring equipment, material and accessories and determining sequencing of operations
- sharpening and shaping cutting tools and drills
- selecting and mounting required tooling or grinding wheels
- setting machining parameters, including using appropriate coolant and lubricants
- checking machined components for conformance to specifications and identifying adjustments to be made to settings/tooling.
- rectifying non-compliant product
- carrying out routine maintenance and adjustments, as required
- reporting/logging malfunctions according to SOPs

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting the chosen sequence of operations
- methods of work holding
- basic marking out techniques, including datum points/lines
- benefits of using correctly sharpened cutting tools
- machine operation
- selection of feeds and speeds to SOPs
- correct methods of mounting selected cutting tools to sops
- safety issues with regard to correct clamping, guards and shields
- tolerances and limits of size
- situations indicating the need for machine adjustment, lubrication and cleaning

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- techniques, tools and equipment to measure materials and machined components
- types and features of industrial grinding wheels, including:
  - international grinding wheel identification system
  - grinding wheel make-up, including bonds and grits
  - purpose and procedure for grinding wheel trueing
  - indicators of a need for grinding wheel dressing, including:
    - wheel glazing
    - wheel loading
    - wheel dresses
    - wheel drilling
- difference between centred and centreless grinding
- indicators of need for dressing, including:
  - loading
  - dulling
  - glazing
  - burn/thermal damage
  - surface finish
- grinding wheel storage and handling
- wheel safety checking, including checks for:
  - cracks
  - defects, including holes, moisture and deterioration
- grinding wheel blotters
- typical range of industrial drills and classification
- drilling machines
- drill sharpening procedures
- drill clamping arrangements
- common reasons for machining failure, including:
  - incorrect speed
  - faulty positioning of work
  - incorrect feed
  - rotation
  - incorrect coolant selection and positioning
- tools, techniques and equipment for checking components for conformance to specifications and rectifying non-compliant components.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing production machining at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07042 Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems

Modification History

Release 1. Supersedes and is equivalent to MEM07042A Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems

Application

This unit of competency defines the skills and knowledge required to undertake corrections to aluminium extrusion solid and hollow dies and die support systems after faulty extrusions have been examined and causes of faults identified.

Where the use of mobile load shifting equipment is required unit MEM11010 Operate mobile load shifting equipment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07001	Perform operational maintenance of machines/equipment
MEM07003	Perform routine machine setting
MEM07004	Perform complex machine setting
MEM07024	Operate and monitor machine and process
MEM07025	Perform advanced machine and process operation
MEM07032	Use workshop machines for basic operations
MEM07043	Identify causes of faulty aluminium extrusions
MEM07044	Test a new aluminium extrusion die
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for die correction**	2.1	Identify regulatory requirements and risk management procedures relevant to die access and handling, extruder operation and die correcting procedures
		2.2	Identify extrusion specifications, extruder operating procedures and other information relevant to die

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			correction task
		2.3	Consult with die designer on intended correction, where required
		2.4	Select appropriate hand tools, hand held power tools, or workshop machines to carry out die corrections
3	**Correct solid dies**	3.1	Calculate intended change in extrusion flow or speed
		3.2	Determine bearing choke angles or length of bearing shortening as appropriate for required correction
		3.3	Speed up flow through appropriate shortening of bearing
		3.4	Slow down flow through appropriate choking of bearing
		3.5	Relieve clearances
		3.6	Supervise or run trial extrusions to test corrections
4	**Correct hollow dies**	4.1	Assess if shortening or choking of mandrel bearings is required and select bearings to be corrected
		4.2	Determine choke angles and length of shortening as appropriate for required corrections
		4.3	Undercut mandrel to widen chambers
		4.4	Increase depth of chamber back into bridge
		4.5	Adjust mandrel stems
		4.6	Adjust weld bridges
		4.7	Speed up flow through appropriate shortening of bearing
		4.8	Slow down flow through appropriate choking of bearing
5	**Undertake basic maintenance of**	5.1	Monitor case and assess when re-nitriding is required
		5.2	Prepare die for re-nitriding

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	dies	5.3	Clean and polish dies
		5.4	Repair fine bearing damage
		5.5	Maintain bearing angle and flatness during polishing and repairs
		5.6	Monitor fittings and devices for lifting die and die support components and arrange replacement or repair as necessary
6	**Adjust die support system and components**	6.1	Ensure toolstack components are flat and square with die and specified toolstack dimensions that will support dies, according to the force the extruder can exert are used
		6.2	Check for and replace any coined bolsters
		6.3	Check die slide alignment is within tolerance and re-align if necessary
		6.4	Report persistent die support related faults after adjustment and recommend redesign or stiffening as appropriate
7	**Maintain die records**	7.1	Record details of all die corrections, including trial extrusions
		7.2	Recommend any simple die design changes that increase productivity and recovery

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07042A Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07042 Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems

Modification History

Release 1. Supersedes and is equivalent to MEM07042A Undertake corrections and basic maintenance to aluminium extrusion dies and die support systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- complying with work health and safety (WHS), regulatory requirements and risk management associated with extruder operation and die handling
- relating intended changes to bearings, apertures, other die components and toolstack components to particular extrusion faults
- adjusting metal flow using workshop machines, hand tools and hand held power tools to correct bearings
- maintaining bearings and other die components to specification
- identifying situations where die or other components must be either scrapped or returned to die manufacturer
- supervising or conducting trial extrusions to verify corrections
- reporting and documenting results of corrections.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- die technology:
  - construction:
    - solid dies
    - hollow dies
    - die support components
    - composition and characteristics of various die steels
    - die manufacturing process
    - nitriding process and purpose
    - extrusion design process and behaviour of typical shapes during extrusion

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    - bearings:
        - shape and definition
        - bearing deflections
        - bearing wash
        - bearing choke where entrance to die aperture is wider than the exit angle
        - negative bearing (entrance is narrower than the exit angle) increases speed of flow
- die support technology and common faults:
    - bolsters:
        - matching of dies to bolsters
        - typical faults in extrusions related to poor bolster selection or fit
    - backers:
        - softening
        - dishing
    - feeder plates:
        - tolerances too close can cause heat related surface defects on extrusions
        - tolerances not matched to bearings in die can cause shape loss
- extrusion process:
    - shape behaviour of typical extrusion products
    - channel shapes and tongue movement faults and typical distortions and corrections
    - runout length variations and possible causes:
        - recycled and unevenly cooled billets
        - out of alignment die slides
        - bearings worn or polished unevenly
    - operator variables:
        - incorrect heat settings
        - incorrect selection of bolster for die
        - poor breakthrough management
    - principles of flow:
        - variation of flow speed through local details and thicknesses
        - variation across container diameter
        - variation due to length of bearing
        - speed of metal through die along with temperature determines how metal flow fills die
    - source and purpose of heating of:
        - billet
        - die
        - extrusion and extrusion created heat
- surface defects and their causes:
    - die lines caused by roughness at surface edges, damaged bearing edges, bearing wash or flaking of nitriding

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  - pick up (surface tearing)
  - streaking
  - blisters
  - inclusions in billets
  - nitriding flaking off die face
- effects of incorrect heat:
  - collapsing of thin walled sections due to over heating
  - blocking of the die
  - surface breakdown and faults:
    - roughness
    - streaking
    - tearing
- dangers of welding extrusion dies
- die efficiency considerations:
  - monitor die performance over time using examine die and extrusion records
  - balance die correction against tonnage, speed and recovery rates
- when to recommend new die or major re-work by die manufacturer where required.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking corrections and basic maintenance to aluminium extrusion dies and die support systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM07043 Identify causes of faulty aluminium extrusions

Modification History

Release 1. Supersedes and is equivalent to MEM07043A Identify causes of faulty aluminium extrusions

Application

This unit of competency defines the skills and knowledge required to systematically examine aluminium extrusions produced on solid and hollow dies for faults that are both die, and non-die related and tracing the reasons for the faults.

It includes determining the most appropriate corrective action for the fault and, where appropriate, providing recommendations to extruder operators, die designers and die manufacturers.

Where the selection and use of power tools/hand held operations is required Unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Collect information on faulty extrusion**	2.1	Liaise with extruder operator on die service or fault correction requests
		2.2	Access and examine die in accordance with procedures
		2.3	Examine extruder records and identify any previous die corrections
		2.4	Consult with die designer on faults, where required
		2.5	Examine extruder maintenance records and liaise with maintenance department
3	**Interpret die drawing and specifications**	3.1	Identify layout and pre-forming of die apertures
		3.2	Identify bearing and pocket design/specification
		3.3	Identify measurements and tolerances for bearings, die components and die support system
		3.4	Identify bolster and spacer specification for die

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.5	Identify press specifications
		3.6	Identify speed estimate for die
		3.7	Identify ports and bridges for hollow dies
4	**Examine faulty extrusions**	4.1	Check extrusions for shape distortion
		4.2	Check extrusion measurements are to specification
		4.3	Inspect surface finish of extrusions for defects
		4.4	Identify whether faults apply from the start to the end of extrusion runouts
		4.5	Make a preliminary assessment as to whether faults are related to die or die support system or other factors
5	**Check for faults not related to die or die support system**	5.1	Examine die and billet heating and temperature records and confirm heating and temperature was to specification
		5.2	Confirm extruder was run at correct speed and other settings were to specification
		5.3	Examine billet history and determine if billet was recycled or faulty
		5.4	Confirm with maintenance department that extruder is free of mechanical, electrical, control or structural faults
6	**Identify die and die support related faults**	6.1	Access die and die support system
		6.2	Inspect die for overall wear, dishing, damage and other defects
		6.3	Inspect bearings for shortening, surface defects, loss of specified angle and clearances
		6.4	Determine if die can be corrected, scrapped or returned to manufacturer

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		6.5	Inspect die support system and components for defects and die slide misalignment
7	**Record cause of fault and communicate as required**	7.1	Prepare recommendations for die correction and obtain any required approvals
		7.2	Prepare recommendations for any changes to process or temperature settings and distribute, as appropriate

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07043A Identify causes of faulty aluminium extrusions

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07043 Identify causes of faulty aluminium extrusions

Modification History

Release 1. Supersedes and is equivalent to MEM07043A Identify causes of faulty aluminium extrusions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- complying with work health and safety (WHS), regulatory requirements and risk management procedures
- identifying bearings, apertures, components, and critical measurements and tolerances on die drawing
- liaising with extruder operators, die designers die makers and maintenance personnel to obtain information to assist in the identification of causes of faults
- identifying root cause of faults in both hollow and solid die extrusions
- identifying die, die support, process and temperature-related shape and surface faults
- identifying appropriate action to take to remedy extrusion faults
- accessing, analysing and adding to die history records.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- die components in an extrusion machine:
  - die
  - die support
  - container
  - support tooling
  - die holder
  - bolsters – single and split systems
  - die slide
  - tool stack
  - bearing

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    - feeder plate
    - backer
    - platen plate
- aluminium extrusion process, including:
    - die heating
    - billet heating
    - loading of dies and billets
    - breakthrough control
    - flow speed
    - rolling
    - quenching
    - stretching
- aluminium extrusion alloys and their extrusion performance
- extruder components and controls
- requirements of AS/NZS 1866:1997 Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes for extruded products
- causes of die deformation, including:
    - damaged or die
    - poor or incorrect die support due to:
        - poor manufacture
        - wear
        - incorrect component placement/selection
- die and die support design and die manufacturing related faults, including:
    - tolerances and clearances too tight and beyond range of realistic correction by die corrector
    - tolerances and clearances too great causing components to move out of position during extrusion leading to flow blockage
- reasons for die blockage, including:
    - die damage
    - over polishing or incorrect die polishing
    - tongue bending
    - bearing clearances too tight
    - overheating of billet
- indicators of die support faults, including:
    - deflecting mandrels
    - die dishing
    - die movement during extrusion
- check for metal extruding inwards or outwards
- effects of nitriding and re-nitriding on die performance
- billet composition and billet heating procedures
- changes in billet composition caused by re-heating

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- process related faults:
  - incorrect temperature settings for pre-heating of billet
  - bad breakthrough control by operator (setting too fast or too high a pressure):
    - poor extruder settings
    - speed through die too fast/slow
    - fouling of section on relief
    - unsuitable support of extrusion after exiting die
    - poor/incorrect quenching
    - faults not subject to action by die corrector
    - poor quality billet
    - mechanical/electrical fault with extruder
- types of extrusion faults and their relationship to die correction techniques and die correction limitations, including:
  - shape distortion:
    - during extrusion
    - on exit from die
    - loss during quenching
  - length overruns
  - section collapse
  - surface faults including:
    - breakdown
    - pickup
    - tearing
    - streaking
- die lines.

Assessment Conditions

- Assessors must:
  - have vocational competency in identifying causes of faulty aluminium extrusions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM07044 Test a new aluminium extrusion die

Modification History

Release 1. Supersedes and is equivalent to MEM07044A Test a new aluminium extrusion die

Application

This unit of competency defines the skills and knowledge required for die correctors working in an aluminium extrusion workplace who are required to undertake the initial testing of new extrusion solid and hollow dies. It includes liaison with die designers and makers on the performance of the new die and making corrections to the die to ensure optimal performance.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM07043	Identify causes of faulty aluminium extrusions
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Machine and process operations

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Interpret die drawing and die specifications relevant to die trial**	2.1	Identify regulatory requirements and risk management requirements associated with extruder operation and die handling
		2.2	Identify layout and pre-forming of die apertures
		2.3	Identify bearing and pocket design/specification
		2.4	Identify measurements and tolerances for bearings, die components and die support system
		2.5	Identify bolster and spacer specification for die
		2.6	Identify press specifications
		2.7	Identify speed estimate for die
		2.8	Identify ports and bridges for hollow dies
3	**Liaise with die designer**	3.1	Clarify die drawing and die specifications with die designer where design information is not clear
		3.2	Determine if die requires finishing off and clarify final design measurements, tolerances and speed specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Obtain any special instructions from die designer for conduct of test extrusions
4	**Finish off die, if required**	4.1	Finish lands and bearings to specified tolerances
		4.2	Finish ports, bridges and mandrels of hollow dies, if required
		4.3	Undertake any final polishing
		4.4	Confirm all measurements are to design specification after finishing off
5	**Analyse trial extrusions**	5.1	Check extruder and surrounds for compliance with operation safety requirements
		5.2	Operate or supervise operation of extrusion press to produce trial extrusions
		5.3	Check hot extrusions for shape distortion
		5.4	Check thickness of extrusions are to specification
		5.5	Check surface finish of extrusions
		5.6	Identify whether faults apply from the start to the end of the run-out of the extrusions
		5.7	Conduct additional trial extrusions to confirm extrusion faults occur consistently
		5.8	Record extruder settings for each trial extrusion
6	**Identify appropriate remedy for out-of-specification results**	6.1	Examine faulty extrusions and determine if fault relates to die design, incorrect process or temperature settings, or faulty die support system
		6.2	Determine fault is die related and able to be eliminated through correction of die
		6.3	Determine if fault can be corrected through adjustments

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			to die supports
		6.4	Determine if fault can be eliminated through adjusted process control or billet heating
		6.5	Recommend either return of die for re-design or manufacture of a new die where faults are unable to be corrected
7	**Re-test die after correction**	7.1	Conduct trial extrusions after correction of die, die support adjustment or process or temperature adjustment
		7.2	Return die to die manufacturer if faulty extrusions persist
		7.3	Record adjustments to die on die design drawings ensuring correct feedback codes are used
		7.4	Record adjustments made to die support system, process and temperature settings

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM07044A Test a new aluminium extrusion die

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM07044 Test a new aluminium extrusion die

Modification History

Release 1. Supersedes and is equivalent to MEM07044A Test a new aluminium extrusion die

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- complying with relevant work health and safety (WHS), regulatory requirements and risk management
- identifying bearings, apertures, and critical measurements and tolerances on die drawing
- supervising and conducting trial extrusions
- using workshop machines and hand tools to finish off a die to design specifications
- identifying cause of extrusion faults from both hollow and solid die extrusions
- identifying appropriate action to take to remedy extrusion faults
- reporting and documenting results.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- aluminium extrusion die construction and the extrusion process
- effects of nitriding and re-nitriding on tool performance
- requirements of AS/NZS 1866:1997 Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
- techniques for correcting solid and hollow dies
- die support system, including role and types of feeder plates, bakers, bolsters and spacers
- characteristics and use of extruder components, including:
  - container
  - container liner
  - billet
  - die slide
  - pressure rings
  - platen

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- characteristics and use of hollow die components, including:
  - weld chamber
  - mandrel
  - die holder
  - weld feeds
  - bridges
  - ports
- die and extruder performance and adjustment records.

Assessment Conditions

- Assessors must:
  - have vocational competency in testing new aluminium extrusion dies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08001 Perform wire, jig and barrel load/unload work

Modification History

Release 1. Supersedes and is equivalent to MEM08001B Perform wire, jig and barrel load/unload work

Application

This unit of competency defines the skills and knowledge required to load barrels for mass finishing processes, undertake jig work for non-electrolytic processes, undertake wire jig and rack work for electrolytic processes, and unload and remove jigs after finishing.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Surface finishing

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPS
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Load barrels for mass finishing processes**	2.1	Load machinery taking into account load mass
		2.2	Secure machine access openings in accordance with SOPs
3	**Undertake jig work for non-electrolytic processes**	3.1	Secure components appropriately using SOPs
4	**Undertake wire jig and rack work for electrolytic processes**	4.1	Select type and size of wire or rack and inspect for conformance to specification
		4.2	Identify damaged racks for repair or replacement
		4.3	Secure components presenting appropriate faces according to procedures
5	**Unload and remove jigs after finishing**	5.1	Unload and stack components without causing damage to the finish following SOPs
		5.2	Remove and store jigs following SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Non-electrolytic processes include one (1) or more of the following:

- degreasing
- de-scaling
- surface blasting
- flame cleaning
- wet blasting
- grinding
- polishing
- wet coating
- powder coating
- electroplating
- anodising
- electroless plating
- electrophoretic coating
- hot dip metallising

Damaged racks include one (1) or more of the following:

- damage to plastic coating or contact points
- ensuring good electrical contact
- positioning to facilitate optimum thickness on significant surfaces
- avoidance of gas entrapment
- position of contact marks

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08001B Perform wire, jig and barrel load/unload work

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Links

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Assessment Requirements for MEM08001 Perform wire, jig and barrel load/unload work

Modification History

Release 1. Supersedes and is equivalent to MEM08001B Perform wire, jig and barrel load/unload work

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- loading into surface finishing machinery safely and with correct material load mass
- securing and positioning components to minimise damage and securing machine access openings
- unloading and stacking components to minimise damage
- selecting the correct type and size of wire or rack
- identifying damaged racks for repair or replacement
- undertaking jig work for non-electrolytic processes in conformance to specifications
- undertaking wire jig and rack work for electrolytic processes in conformance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for loading machinery for mass finishing processes
- distribution of the components in the machinery and reasons for distributing the components in a particular manner
- procedures for securing machine access openings and consequences of not securing machine access openings
- procedures for jigging work for non-electrolytic processes
- precautions to be taken when jigging work for non-electrolytic finishing processes
- appropriate types and sizes of wire or racks used in conjunction with surface finishing using electrolytic processes
- different faces to be surface finished/coated
- procedures for securing the components to be surface finished using electrolytic processes
- procedures for unloading and stacking surface finished components

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- damage that can be caused by inappropriate handling and storing of surface finished components.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing wire, jig and barrel loading and unloading work at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM08002 Pre-treat work for subsequent surface coating

Modification History

Release 1. Supersedes and is equivalent to MEM08002C Pre-treat work for subsequent surface coating

Application

This unit of competency defines the skills and knowledge required to carry out pre-treatment of common ferrous and non-ferrous work for finishing by a wide variety of processes and involves adjustments to apparatus/ equipment/ controls.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

This unit should not be selected if unit MEM08003 Perform electroplating operations has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Perform pre-treatment processes in correct sequence**	2.1	Identify common surface soils and conditions
		2.2	Carry out appropriate pre-treatment processes to SOPs
		2.3	Monitor pre-treatment process parameters to ensure they remain within specified limits

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Common metals include one (1) or more of the following:

- steel
- copper
- brass
- zinc
- cast iron
- stainless steel

Processes include (1) one or more of the following:

- wet coating
- powder coating
- electroplating
- anodising
- electroless plating
- electrophoretic coating
- hot dip metallising

Surface soils and conditions include one (1) or more of the following:

- oils
- greases
- drawing compounds
- cutting lubricants
- buffing lubricants
- rust
- scale

Pre-treatment processes include one (1) or more of the following:

- solvent degreasing
- alkaline cleaning
- pickling
- acid dipping

Process parameters include one (1) or more of the following:

- temperature
- time
- current/voltage
- solution compositions

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08002C Pre-treat work for subsequent surface coating

Links

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Assessment Requirements for MEM08002 Pre-treat work for subsequent surface coating

Modification History

Release 1. Supersedes and is equivalent to MEM08002C Pre-treat work for subsequent surface coating

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- recognising common surface soils and conditions from given samples
- carrying out pre-treatment processes
- monitoring and adjusting the pre-treatment process parameters within specified limits.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of common metals, alloys and non-metals and procedures and techniques for identifying them
- common surface soils and conditions and the procedures for identifying the type(s) of soil on surfaces to be finished
- simple tests that can be used to assist in identifying surface soils and conditions
- pre-treatment processes and procedures applicable to a range of materials, surface soils and conditions
- parameters and procedures for monitoring pre-treatment processes.

Assessment Conditions

- Assessors must:
  - have vocational competency in pre-treating work for subsequent surface coating at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM08003 Perform electroplating operations

Modification History

Release 1. Supersedes and is equivalent to MEM08003C Perform electroplating operations

Application

This unit of competency defines the skills and knowledge required to perform a range of metal plating processes in the electroplating, electronics, jewellery manufacture and metal fabrication industries.

It includes the general operation, monitoring and adjustment of manual, semi and automatic electroplating processes and applies to volume production and 'jobbing' involving rack and barrel type processes.

Where simple operating and monitoring of the electroplating process is required unit MEM07024 Operate and monitor machine and process should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

This unit should not be selected if unit MEM07025 Perform advanced machine and process operation has already been selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

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Pre-requisite Unit

MEM07001	Perform operational maintenance of machines/equipment
MEM08001	Perform wire, jig and barrel load/unload work
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Identify untreated materials and the required electroplating treatment
2	**Prepare for electroplating process**	2.1	Check materials and racking arrangement for non-conformance to specifications/job requirements
		2.2	Check all plant and equipment relevant to process for compliance with safety and operational requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.3	Check instrumentation and gauges for operation
	2.4	Check condition of solution
3 **Perform electroplating operations**	3.1	Carry out operations in the correct sequence according to work instructions and SOPs
	3.2	Ensure compliance with process operating parameters
	3.3	Make adjustments to rectify any process deviation
	3.4	Report uncontrollable variances to appropriate persons
	3.5	Carry out a visual inspection of finished products for compliance to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Electroplating requirements include one (1) or more of the following:	• coating thickness • appearance • ductility • hardness • corrosions resistance • wear
Untreated materials	• steel

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:	• copper • brass • cast iron • stainless steel
Electroplating treatment includes one (1) or more of the following:	• pre-treatment • electroplating operations • post treatment
Check includes (1) one or more of the following:	• componentry • electrodes • circuitry equipment
Instruments and gauges include one (1) or more of the following:	• volt meters • ammeters • temperature recorders/indicators • AMP per hour meters
Electroplating operations include one (1) or more of the following:	• engineering coatings • protective finishes • decorative plating
Adjustment includes one (1) or more of the following:	• time • temperature • current density • voltage
Visual inspection includes one (1) or more of the following:	• surface texture • brightness • free from roughness • pitting • cracking • machining marks

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08003C Perform electroplating operations

Links

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Assessment Requirements for MEM08003 Perform electroplating operations

Modification History

Release 1. Supersedes and is equivalent to MEM08003C Perform electroplating operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying all materials and the process to be used to electroplate products
- preparing all equipment, instrumentation/gauges and materials for the electroplating process
- starting up, operating, monitoring and regulating the electroplating equipment and process
- rectifying process deviations within the operator's scope of control
- inspecting electroplated products to ensure they meet specification.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of a variety of base materials that can be plated
- electroplating process, machine components, treatment solutions and process parameters and operational requirements of all plant and equipment
- electroplating solutions and handling procedures
- electroplating treatment stages and information relevant to plating products, treatment baths and settings
- electroplating pre-treatment, treatments and post-treatments in relation to task requirements
- electroplating equipment checks
- purpose and typical settings of different instruments/gauges
- sequences and requirements involved in moving materials and reasons for rejecting incorrectly loaded work
- the range of adjustments permissible for electroplating operating parameters, including voltage, current and temperature
- common electroplated product faults and imperfections/deviations and adjustments that can be made to suit specific process deviations

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- variances in electroplated products that are outside the control of the operator
- effects of rust, corrosion and other contaminants on electroplated products.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing electroplating operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM08004 Finish work using wet, dry and vapour deposition methods

Modification History

Release 1. Supersedes and is equivalent to MEM08004B Finish work using wet, dry and vapour deposition methods

Application

This unit of competency defines the skills and knowledge required to finish work using a range of wet and dry organic coatings by hand or utilising a wide range of machines or semi or fully automatic plant.

Where straightforward monitoring of semi or automatic machine or process is undertaken unit MEM07024 Operate and monitor machine and process should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM08002	Pre-treat work for subsequent surface coating
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Assess and prepare components for required coating process**	2.1	Identify coating specifications from operation sheets/work procedures
		2.2	Check suitability of pre-treated components for finishing process according to enterprise procedures
		2.3	Prepare components for finishing application, as required
		2.4	Position/locate components for finishing according to enterprise procedures
3	**Perform simple mixing and estimating operations**	3.1	Calculate mixing ratios and mix and thin a range of wet coatings to SOPs, as required
		3.2	Estimate required coating quantities using simple surface area calculations

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Perform coating operation**	4.1 Set up equipment to specification
	4.2 Monitor coating and applied curing technique
	4.3 Check coating application, thickness and colour and maintain for compliance with specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Coating includes one (1) or more of the following:	• electrostatic powder coating • electrophoretic coating • industrial spray coating and lacquering • electroless (auto catalytic) nickel or copper plating • phosphating • chromating • galvanising • hot tinning • sputter deposition • vacuum evaporation • ion plating • paints • stains • other liquid finishes
Prepared includes one (1) or more of the	• visual inspection for contamination • masking out

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:	• racking • identification of correct materials to be used • ensuring cleanliness of work area and equipment • operational testing of equipment
Coating operation includes one (1) or more of the following:	• spray application • dip coating

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08004B Finish work using wet, dry and vapour deposition methods

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08004 Finish work using wet, dry and vapour deposition methods

Modification History

Release 1. Supersedes and is equivalent to MEM08004B Finish work using wet, dry and vapour deposition methods

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying components for coating, checking their condition and suitability for coating to accurately determine the process and materials required
- preparing and locating components for coating
- calculating surface area of components to be coated to determine the required coating quantities
- setting up and operating coating equipment, coating products and curing the coating
- checking that the thickness and colour meets specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- coating work and the correct process to be used for given components
- coating specifications
- appropriate type of racking for the coating process and reasons for selecting the chosen rack type
- procedures for racking components to be coated
- source of data on mixing ratios for wet coatings to determine mixing ratios for given tasks
- function of thinners as applied to the application of wet coatings
- procedures to be followed when mixing wet coatings
- calculation techniques to determine the surface area to be coated and the coverage rate of the coating material to be applied
- procedures for estimating quantities of coating materials
- types of equipment used for a variety of coating processes and reasons for selecting the chosen equipment for given coating tasks
- operating procedures applicable to the selected coating equipment

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- coating and curing techniques and reasons for selecting the chosen coating and curing techniques
- monitoring coating procedures to be followed
- examples of coating defects and their causes
- procedures for rectifying and/or reporting coating defects
- coating thickness and colour to be achieved and the means of checking this including the frequency of checks to be undertaken.

Assessment Conditions

- Assessors must:
  - have vocational competency in finishing work using wet, dry and vapour deposition methods at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM08005 Prepare and produce specialised coatings

Modification History

Release 1. Supersedes and is equivalent to MEM08005B Prepare and produce specialised coatings

Application

This unit of competency defines the skills and knowledge required to undertake masking and jig work, determine operational parameters, and pre-treat and treat work for an application of specialised production of industrial films on a variety of work pieces, often on a one-off basis.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM08002	Pre-treat work for subsequent surface coating
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Undertake mask and jig work**	2.1	Manufacture necessary jigs and shields, as required
		2.2	Secure jigs and ensure masking is adherent and stable
		2.3	Incorporate necessary auxiliary anodes and shields to specifications
3	**Pre-treat and treat work**	3.1	Use plating information and/or specifications to calculate operating times, currents and/or voltages
		3.2	Treat work in accordance with specifications using SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Coatings include one (1) or more of the following:	• heavy (hard) chromium or nickel • heavy electroless nickel • 'hard' anodising • selective (brush) plating
Auxiliary electrodes and shields include one (1) or more of the following:	• soluble auxiliary anodes • insoluble auxiliary anodes • bi polar electrodes • shields • robbers

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08005B Prepare and produce specialised coatings

Links

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Assessment Requirements for MEM08005 Prepare and produce specialised coatings

Modification History

Release 1. Supersedes and is equivalent to MEM08005B Prepare and produce specialised coatings

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- using and/or making jigs and shields and masking up for a variety of work pieces prior to application of specialised coatings
- setting up auxiliary anodes and shields as necessary for the coating application
- calculating coating parameters and pre-treating and applying coatings to meet specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for pre-electroplating and post-electroplating treatment of surfaces
- processes and techniques for masking work being electroplated and the range of materials used for masking purposes
- procedures for securing the masking
- procedures for mounting/setting up auxiliary electrodes and shields and reasons for using them
- electrode position of 'difficult' metals such as iron and certain alloys
- specifications and procedures of jigs and shields to be manufactured
- procedures and formulae for calculating operating times, currents and voltages
- specifications of surface finishes
- procedures and specifications for pre-treating specialised coating work and for treating the work after electroplating.

Assessment Conditions

- Assessors must:

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  - have vocational competency in preparing and producing specialised coatings at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM08006 Produce clear and/or coloured and/or sealed anodised films on aluminium

Modification History

Release 1. Supersedes and is equivalent to MEM08006B Produce clear and/or coloured and/or sealed anodised films on aluminium

Application

This unit of competency defines the skills and knowledge required to produce clear or coloured sealed anodised films on aluminium and its alloys in applicable applications. Colouring is produced by dyeing or by 'in-bath' processes.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM08002	Pre-treat work for subsequent surface coating
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare for anodising**	2.1	Apply taping and waxing masking techniques, where required
		2.2	Minimise contact marks and shielding
3	**Assess preparation of work for correct jigging/loading**	3.1	Connect work correctly for the required current flow with minimum contact marks and shielding
		3.2	Reject all incorrectly loaded work
4	**Anodise work**	4.1	Carry out anodising treatment steps following SOPs
		4.2	Carry out sealing or dyeing and sealing steps following SOPs
		4.3	Maintain process parameters within specified limits

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Applications include one (1) or more of the following:	• electrical • decorative • mechanical • architectural purposes
Anodising steps include (1) one or more of the following:	• pre treatment • anodising • dyeing • sealing
Masking techniques include one (1) or more of the following:	• taping • waxing
Process parameters include one (1) or more of the following:	• temperature • current density • time

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08006B Produce clear and/or coloured and/or sealed anodised films on aluminium

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08006 Produce clear and/or coloured and/or sealed anodised films on aluminium

Modification History

Release 1. Supersedes and is equivalent to MEM08006B Produce clear and/or coloured and/or sealed anodised films on aluminium

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing aluminium and aluminium alloy work pieces for anodising, including masking up
- loading work and carrying out pre-treatment steps, including connecting the work to the required electrical current
- producing clear and coloured and sealed anodised films on aluminium and its alloys by maintaining process parameters
- sealing and dying anodised work to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- process for anodising aluminium
- materials, techniques and procedures for masking materials during anodising
- causes of contact marks and shielding during the anodising process and procedures for minimising contact marks and shielding
- procedures for connecting the work to the electrical current and the electrical current required for the anodising process
- methods for correctly loading work and recognising incorrectly loaded work
- reasons for rejecting incorrectly loaded work
- steps to be carried out in the seal/dye and seal process
- procedures and reasons for monitoring and maintaining the process parameters within the specified limits.

Assessment Conditions

- Assessors must:

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  - have vocational competency in producing clear and/or coloured and/or sealed anodised films on aluminium at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08007 Control surface finish production and finished product quality

Modification History

Release 1. Supersedes and is equivalent to MEM08007B Control surface finish production and finished product quality

Application

This unit of competency defines the skills and knowledge required to apply the principles of quality assurance, research and quality information to the production process, and perform quality tests to industry standards where analyses are confined to the use of basic instruments.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Apply principles of quality assurance**	2.1	Apply quality assurance standards to enterprise specifications
		2.2	Perform quality testing to industry standards and SOPs, as required
3	**Apply research or quality data to production process**	3.1	Undertake liaison with in-house/external control laboratories
		3.2	Interpret data and recommend process changes
		3.3	Implement process changes in accordance with procedures
		3.4	Use laboratory/research data to determine and make changes/corrections to processes

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Basic instruments include one (1) or more of the following:	• pH meters • hydrometers • stalagmometers • laboratory balances
Quality testing includes one (1) or more of the following:	• hardness • adhesion • deposit stress • coating thickness • corrosion resistance • visual inspection

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08007B Control surface finish production and finished product quality

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08007 Control surface finish production and finished product quality

Modification History

Release 1. Supersedes and is equivalent to MEM08007B Control surface finish production and finished product quality

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- applying quality standards to production processes in order to meet enterprise/industry specifications
- safely handling surface finished products when undertaking quality testing and control
- undertaking testing of surface finishes in the production environment to industry standards
- liaising effectively with internal/external control laboratory
- analysing results and other data to implement effective process changes/corrections
- using appropriate tests, test equipment and techniques to test the surface coating for conformance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- enterprise and industry quality assurance standards that apply to surface finish production and product quality
- role of the control laboratory and procedures for liaising with internal/external control laboratories
- surface finish specifications
- characteristics of deviations of test/production data and their causes
- procedures, calculations and formulae for determining surface finish process parameters
- effect of varying process parameters on the specification of the surface finish
- surface coating tests and the procedures, equipment and techniques necessary to carry out those tests
- manual handling techniques.

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Assessment Conditions

- Assessors must:
  - have vocational competency in controlling surface finish production and finished product quality at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08008 Operate and control surface finishing waste treatment process

Modification History

Release 1. Supersedes and is equivalent to MEM08008B Operate and control surface finishing waste treatment process

Application

This unit of competency defines the skills and knowledge required to treat and purify metal finishing effluent waters which typically contain cyanides, hexavalent chromium, heavy metal cations, certain anions and greases using appropriate pre-determined waste treatment processes.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 3

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Load waste product**	2.1	Obtain waste from production process via established procedures
		2.2	Load waste in accordance with standard operating procedures for waste/effluent
3	**Monitor effluent water treatment process**	3.1	Monitor all process parameters and record to identify waste/effluent
		3.2	Check recording devices for correct/continuous operation
4	**Adjust process**	4.1	Apply knowledge of waste treatment processes in determining appropriate adjustments
		4.2	Check process parameters to ensure they remain within specified limits
		4.3	Make all adjustments to accord with regulatory requirements regarding waste
		4.4	Undertake appropriate corrective action in the event of any mechanical failure

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Waste/effluent includes one (1) or more of the following:	• rinse waters • spent solutions • spills • leaks
Recording devices include one (1) or more of the following:	• pH meter • oxidising/reduction/potential probes (redox) • flow rate
Waste treatment processes include one (1) or more of the following:	• chemical treatments • neutralisation • metal precipitation • solid separation (gravity, centrifuging) • oxidation • reduction • grease entrapment • ion exchange • reverse osmosis • gas scrubbing
Process parameters include one (1) or more of the following:	• solution flow • pH • redox (oxidising /reduction/potential) which typically contain cyanides, hexavalent chromium, heavy metal cations, certain anions and greases

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08008B Operate and control surface finishing waste treatment process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08008 Operate and control surface finishing waste treatment process

Modification History

Release 1. Supersedes and is equivalent to MEM08008B Operate and control surface finishing waste treatment process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- loading and monitoring surface finishing waste products safely
- applying correct procedures to control the treatment and purification of waste products
- maintaining waste product treatment processes and outcomes to meet regulatory and enterprise/industry standards
- taking corrective action in response to mechanical failure.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- hazards and control measures associated with handling waste products, including possible effects of surface finishing waste on the environment
- safety precautions to be taken when handling/loading the waste/effluent
- process parameters to be monitored and the procedures for monitoring these and identifying waste/effluent
- procedures for checking process parameter recording devices and recording process parameters
- adjustments that can be made to the waste treatment process and their effect on the condition of the waste
- procedures for adjusting process parameters and the specified limits for each parameter
- legislative and regulatory requirements relating to waste management
- corrective actions that can be taken in treating waste products and the reasons for taking proposed corrective actions.

Assessment Conditions

- Assessors must:

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  - have vocational competency in operating and controlling surface finishing waste treatment processes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08009 Make up solutions

Modification History

Release 1. Supersedes and is equivalent to MEM08009C Make up solutions

Application

This unit of competency defines the skills and knowledge required to make up solutions and maintain process specific equipment, including probes and electrodes.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

This unit should not be selected if any the following units have been selected:

- MEM08018 Electroplate engineering coatings
- MEM08019 Electroplate protective finishes; and/or
- MEM08020 Electroplate decorative finishes

Maintenance of solution ratio and purity is covered by other units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare solution**	2.1	Identify appropriate solutions for application requirements or specifications
		2.2	Calculate volumes, density and solution concentration for effective operation
		2.3	Make up suitable volume of solution from supplier's instructions and/or manual in accordance with SOPs
		2.4	Refer spent solutions to waste treatment processing in accordance with procedures
3	**Maintain process specific equipment**	3.1	Carry out inspection of probes and electrodes
		3.2	Rectify faults or defects, as required
		3.3	Recalibrate meter probes, as required

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08009C Make up solutions

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08009 Make up solutions

Modification History

Release 1. Supersedes and is equivalent to MEM08009C Make up solutions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, standards, codes, legislation, and company and customer requirements for making up solutions
- calculating solution parameters and quantities to meet specifications
- preparing appropriate solutions for the required operation
- ensuring waste solution products are provided for treatment to meet regulatory and enterprise/industry standards
- maintaining process-specific equipment, including probes and electrodes.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications, standards, codes, legislation, and company and customer requirements for making up solutions
- reasons for selecting an appropriate sequence of operations for making up solutions
- solution concentrations
- procedures for making up solution
- procedures for inspecting probes and electrodes
- procedures and techniques for recalibrating meter probes and equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in making up solutions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08010 Manually finish/polish materials

Modification History

Release 1. Supersedes and is equivalent to MEM08010B Manually finish/polish materials

Application

This unit of competency defines the skills and knowledge required to finish and polish materials using appropriate media and equipment.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

This unit is not intended to apply to touch-up finishing related to maintenance or assembly activities.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify job materials and surface condition**	2.1	Identify common metals, alloys and non-metals for finishing
		2.2	Identify common surface imperfections
3	**Select appropriate finishing/polishing procedure**	3.1	Determine surface finish specifications and select appropriate finishing or polishing method/technique for the work requirements
		3.2	Select appropriate finishing or polishing equipment for the work material and work requirements
		3.3	Select appropriate media for work requirements
4	**Install and set up grinding and polishing devices according to standard operating procedures**	4.1	Fit endless belt linishers
		4.2	Fit and dress grinding wheels and mops
		4.3	Install and set up polishing mops

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Grind, finish, brush and/or polish job**	5.1 Identify hazards and implement risk control measures and procedures
	5.2 Finish job surface to specification according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Applications include one (1) or more of the following:	• pre-decorative and post decorative plating • jewellery production • component manufacture and machining • marine vessel construction
Material includes one (1) or more of the following:	• cast iron • steel • zinc and its alloys • copper • aluminium and its alloys • bronzes • sterling silver • gold • plastics
Common surface imperfections include one (1) or more of the	• pitted surface • machining lines • scale

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

following:	• rust
Finish includes one (1) or more of the following:	• brightness • texture • roughness comparison
Finishing/polishing equipment includes one (1) or more of the following:	• endless belt grinders • table linishers • pedestal grinders and polishers • felt wheels • fabric mops and brushes with underhand and overhand techniques • flexible drive appliances • buffing compounds • cutting compounds • abrasive belts
Finishing/polishing media includes the following:	• solid and liquid compositions containing alumina, silicon carbide, diamond dust, tripoli, calcium oxide and iron oxides
Hazards include one (1) or more of the following:	• airborne dust inhalation • unsecured components

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08010B Manually finish/polish materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08010 Manually finish/polish materials

Modification History

Release 1. Supersedes and is equivalent to MEM08010B Manually finish/polish materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate finishing process, media and equipment to manually finish metal and plastic materials
- installing and setting up grinding and polishing devices and equipment
- assessing the surface condition of materials to determine the necessary finishing treatment
- safely applying techniques, including grinding, brushing and/or polishing to meet specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- surface finishing specifications
- procedures, tools and techniques for fitting and adjusting endless belts on linishing machines
- procedures, tools and techniques required to fit and dress grinding wheels and mops
- procedures tools and techniques for installing and setting up polishing mops
- characteristics of common metals, alloys and plastics relevant to finishing work
- finishing and polishing methods/techniques and the appropriate polishing media to be used in finishing/polishing for different types of materials
- effect of different types and grades of polishing media on the surface finish
- reasons for selecting a specific method/technique
- common surface imperfections/defects and how they can be removed/repaired by manual finishing/polishing procedures
- procedures for handling components with surface imperfections/defects that cannot be removed/repaired
- methods and techniques to check for conformance to finishing specifications.

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Assessment Conditions

- Assessors must:
  - have vocational competency in manually finishing and polishing materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08011 Prepare surfaces using solvents and/or mechanical means

Modification History

Release 1. Supersedes and is equivalent to MEM08011B Prepare surfaces using solvents and/or mechanical means

Application

This unit of competency defines the skills and knowledge required to select the appropriate preparation process, select and set up the equipment, undertake blasting or application of solvents on metal and non-metal materials, and check the finished surface.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify surface preparation requirements from specifications, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Select appropriate solvent and solvent application to meet job specification
		2.2	Select appropriate mechanical equipment to meet job specification
		2.3	Prepare worksite for surface cleaning activities
3	**Set up equipment**	3.1	Set up and prepare appropriate equipment and any required consumables in accordance with manufactures' specifications and SOPs
4	**Prepare surfaces using solvents as required**	4.1	Establish safe working environment for solvent use according to regulatory requirements and SOPs
		4.2	Apply solvent in accordance with procedures
		4.3	Neutralise treated surface and make it safe to handle
5	**Prepare surfaces using mechanical**	5.1	Establish safe working environment for mechanical surface preparation according to regulatory requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	means as required		and procedures
		5.2	Prepare surfaces using mechanical means
		5.3	Clean mechanical equipment and check for damage and operational faults, in accordance with procedures
		5.4	Record any equipment faults and report in accordance with SOPs
6	**Inspect prepared surface**	6.1	Check surface preparation for cleanliness and conformance to specifications
		6.2	Rectify faults or defects where required and record/report in accordance with procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Surface preparation includes the following:	• new surfaces and restoration work
Solvents include one (1) or more of the following:	• acids • chlorinated solvents • hydrocarbons
Solvent application methods include one (1) or	• spraying • wiping

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

more of the following:	• brushing • vapour degreasing
Mechanical equipment includes one (1) or more of the following:	• linishers • grinders • polishers • sanders • blast device • enclosures • air grinders
Consumables include one (1) or more of the following:	• emery cloth/belts • grinding/sanding disks • grinding accessories

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08011B Prepare surfaces using solvents and/or mechanical means

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08011 Prepare surfaces using solvents and/or mechanical means

Modification History

Release 1. Supersedes and is equivalent to MEM08011B Prepare surfaces using solvents and/or mechanical means

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the type of surface preparation required for a range of surfaces
- selecting and setting up surface preparation equipment and consumables for the job
- undertaking mechanical preparation or application of solvents, as required
- inspecting the finished surface to ensure it meets specifications
- rectifying faults or defects, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- common surface contaminates, conditions
- features of and reasons for selecting solvents
- characteristics and uses of mechanical equipment required for surface preparation and procedures for setting up equipment
- specifications applying to surfaces to be prepared
- methods for neutralising solvents
- tools, equipment, abrasives and other materials used in surface preparation
- procedures for maintaining/storing mechanical equipment and for recording/reporting faulty equipment
- procedures for checking prepared surfaces and rectification techniques where necessary to meet specifications.

Assessment Conditions

- Assessors must:

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  - have vocational competency in preparing surfaces using solvents and/or mechanical means at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08012 Prepare surfaces by abrasive blasting (basic)

Modification History

Release 1. Supersedes and is equivalent to MEM08012B Prepare surfaces by abrasive blasting (basic)

Application

This unit of competency defines the skills and knowledge required to follow pre-determined procedures to perform, at a basic level of skill, surface preparation/cleaning on both ferrous and non-ferrous masonry and cementatious materials/components.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM08016	Control blast coating by-products, materials and emissions
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Identify equipment to be used as per job requirements
		2.2	Obtain blasting media which meets job requirements
		2.3	Prepare worksite for surface cleaning activities
3	**Set up equipment**	3.1	Assemble, set up and correctly and safely prepare appropriate equipment and any required consumables in accordance with manufacturers' specifications and workplace procedures
		3.2	Obtain specified rust inhibitor, including the specified amount, to reduce the rate of corrosion when using wet abrasive blast methods, as required
		3.3	Carry out pre-operational checks on equipment, and rectify faults or report for further action
4	**Prepare surfaces using abrasive blasting**	4.1	Operate blasting equipment in accordance with procedures
		4.2	Undertake emergency shutdown procedures, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Undertake work procedures to appropriate environmental requirements
	4.4 Carry out abrasive media disposal in accordance with environmental regulations and procedures
	4.5 Disassemble, clean and inspect blasting equipment in accordance with manufacturers' specifications
	4.6 Record equipment faults and report in accordance with SOPs
5 **Inspect prepared surface**	5.1 Assess surface preparation for cleanliness and conformance with specifications
	5.2 Rectify faults or defects where required and record inspection results and report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Blasting process includes one (1) or more of the following:	• water • air steam • grits • blasting mediums
Blasting media includes	• abrasives

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• shot • glass beads • sand • steel shot • garnet • other mediums accepted by industry and all regulatory bodies
Blasting equipment includes one (1) or more of the following:	• electric and diesel compressors • blast pots • blast rooms • centrifugal blast machines • water pressure washers to 35,000 kPa • air hoses and nozzles • specified hand and power tools

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08012B Prepare surfaces by abrasive blasting (basic)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08012 Prepare surfaces by abrasive blasting (basic)

Modification History

Release 1. Supersedes and is equivalent to MEM08012B Prepare surfaces by abrasive blasting (basic)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, supplier information, and Australian and international standards for abrasive blasting
- preparing surfaces by abrasive blasting
- setting up, using and maintaining surface blasting equipment safely and effectively, reporting any faults
- using the correct media for the blasting operation and preparing surfaces
- demonstrating emergency shutdown procedures
- disposing of abrasive media in accordance with regulatory and legislative requirements
- inspecting to ensure the prepared surface meets specifications and rectifying any non-conformance, as necessary.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reason for selecting the chosen sequence of operations
- blasting equipment and media required for various surface preparation methods
- importance of using an appropriate rust inhibitor
- process for undertaking pre-operational checks and procedures or using abrasive blasting equipment
- reasons for an emergency shutdown
- emergency shutdown procedures
- procedures for abrasive media disposal to meet environmental regulations
- procedures for maintaining and storing blasting equipment and recording/reporting procedures for any faulty equipment
- techniques for checking prepared surfaces and rectification techniques, as required.

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Assessment Conditions

- Assessors must:
  - have vocational competency in preparing surfaces by abrasive blasting (basic) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08013 Prepare surfaces by abrasive blasting (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM08013B Prepare surfaces by abrasive blasting (advanced)

Application

This unit of competency defines the skills and knowledge required to perform, at an advanced level of skill, surface preparation using abrasive blasting.

The operation and maintenance of compressed air systems and associated items, including emergency shutdown procedures is included.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM08012	Prepare surfaces by abrasive blasting (basic)
MEM08016	Control blast coating by-products, materials and emissions
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare to undertake work**	2.1	Select appropriate abrasive blasting process and equipment to meet job specification
		2.2	Select appropriate abrasive blasting media to meet job specification
		2.3	Prepare worksite for surface cleaning activities
3	**Set up equipment**	3.1	Assemble, set up and correctly and safely prepare appropriate equipment and any required consumables in accordance with manufacturers' specifications and workplace procedures
		3.2	Select correct rust inhibitor to reduce corrosion for use in wet abrasive blast methods, where required
		3.3	Carry out pre-operational checks on equipment, rectify faults or report for further action

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Inspect surface prior to cleaning**	4.1	Inspect work piece prior to cleaning in accordance with procedures
		4.2	Report identified faults/defects requiring remedial or pre-treatment action, as required
5	**Prepare surfaces using abrasive blasting**	5.1	Operate blasting equipment in accordance procedures
		5.2	Undertake emergency shutdown procedures, as required
		5.3	Undertake work to meet environmental requirements
		5.4	Carry out abrasive media disposal in accordance with environmental requirements and procedures
		5.5	Disassemble, clean and inspect blasting equipment in accordance with manufacturers' specifications
		5.6	Record equipment faults and report in accordance with SOPs
6	**Inspect prepared surface**	6.1	Assess surface preparation for cleanliness and conformance with specifications
		6.2	Rectify faults or defects where required and record inspection results and report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Blasting process includes one (1) or more of the following:	• wet • dry • vacuum automatic rotary • centrifugal • water blasting (including HP and UHP)
Blasting media includes one (1) or more of the following:	• garnet • ilmenite • slags • steel grit • steel shot • water • glass bead • soda
Equipment includes one (1) or more of the following:	• blast nozzles • compressors • blast and helmet ventilation • air hoses • blast pots • nozzles • safety equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08012B Prepare surfaces by abrasive blasting (advanced)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08013 Prepare surfaces by abrasive blasting (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM08013B Prepare surfaces by abrasive blasting (advanced)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, supplier information and Australian and international standards for advanced abrasive blasting
- determining the appropriate means of preparing surfaces by abrasive blasting
- selecting, setting up, using and maintaining surface blasting equipment safely and effectively, reporting any faults
- demonstrating emergency shutdown procedures
- selecting and using the correct media for the blasting operation and preparing surfaces
- disposing of abrasive media in accordance with regulatory and legislative requirements
- inspecting to ensure the prepared surface meets specifications and rectifying any non-conformance, as necessary.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- calculations and numerical operations for surface preparation using advanced blasting operations
- blasting media features and uses
- equipment for the selected method
- inspection procedures for surface preparation
- procedures for using abrasive blasting equipment
- reasons for an emergency shutdown
- emergency shutdown procedures
- specifications, supplier information and Australian and international standards for advanced abrasive blasting
- procedures for abrasive media disposal to meet environmental requirements.

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Assessment Conditions

- Assessors must:
  - have vocational competency in preparing surfaces by abrasive blasting (advanced) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08014 Apply protective coatings (basic)

Modification History

Release 1. Supersedes and is equivalent to MEM08014B Apply protective coatings (basic)

Application

This unit of competency defines the skills and knowledge required to follow pre-determined procedures to spray pre-treatments and protective coatings at a basic level where an understanding of specific health and safety matters is required. It covers single and two-pack coatings not containing isocyanates.

Where isocyanates are present unit MEM08015 Apply protective coatings (advanced) should also be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of mobile load shifting equipment is required unit MEM11004 Undertake dogging and unit MEM11010 Operate mobile load shifting equipment, should also be selected as appropriate.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM11011 Undertake manual handling

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MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
		1.4	Identify and interpret supplier information, product details, Australian and international standards, regulatory and legislative requirements relevant to the work to be undertaken
2	**Prepare to undertake work**	2.1	Obtain required protective coating materials according to job requirements
		2.2	Gather required protective coating application equipment according to job requirements
		2.3	Prepare worksite for application of protective coating
3	**Select and maintain personal protective equipment (PPE)**	3.1	Select and use appropriate personal protective equipment (PPE) for coating application according to job requirements and SOPs
		3.2	Identify and use ancillary support attachments

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Maintain PPE in accordance with manufacturers' specification and SOPs
4	**Prepare work piece for application of protective coating**	4.1	Inspect surface condition for readiness for application of protective coating according to specification
		4.2	Identify unsuitable work pieces/surfaces and fabrication defects and undertake appropriate remedial action or report in accordance with SOPs
		4.3	Mask components where protective coating application is not specified
		4.4	Identify conditions for overspray
	Prepare equipment for application of surface coating materials	5.1	Undertake routine maintenance on plant and equipment in accordance with procedures
		5.2	Record status/report by proforma or orally in accordance with procedures
		5.3	Assemble conventional coating application equipment in accordance with equipment requirements
6	**Apply single pack coatings**	6.1	Identify coating product type, solvent, uses, mixing procedure, clean-up and safety requirements, as appropriate
		6.2	Demonstrate correct method of wet film thickness in accordance with specified dry film
		6.3	Thin coating material to suit the application method and achieve required film thickness
		6.4	Apply coating using specified application method
		6.5	Use coating schedules for metal and non-metal materials
		6.6	Monitor coating application and curing technique according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

7	**Clean and store equipment**	7.1	Clean and disassemble conventional coating application equipment and inspect for damage
		7.2	Record and report faulty equipment to appropriate personnel in accordance with SOPs
		7.3	Store coating application equipment in accordance with SOPs
8	**Inspect finish surface**	8.1	Assess surface finish for profile size differences and uses
		8.2	Determine coating thickness using appropriate instruments and compare results with job specifications
		8.3	Inspect total surface for conformance to specification in accordance with SOPs
		8.4	Record inspection results in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• brush • roller • conventional spray equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Specific health and safety matters include one (1) or more of the following:	• interpretation of safety data sheet (SDS) warnings • materials sensitivity • hazardous goods • breathable air • introduction of compressed air into the body
PPE includes one (1) or more of the following:	• hand protection • full body protection • respirators • air fed hoods and foot protection • noise and heat protection

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08014B Apply protective coatings (basic)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08014 Apply protective coatings (basic)

Modification History

Release 1. Supersedes and is equivalent to MEM08014B Apply protective coatings (basic)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, supplier information, product details, Australian and international standards, regulatory, legislative requirements and other applicable reference documents in applying protective coatings
- determining the procedures, equipment and processes for applying protective coatings to work
- setting up, maintaining and using personal protective equipment (PPE) suitable for the coating work to be undertaken
- determining the condition and treatment required for the surface/s to be protective coated and masking up, as required
- setting up, operating, cleaning and maintaining coating equipment safely and effectively
- selecting, handling and using protective coating materials safely and in required quantities
- checking surface coating thickness and coverage to ensure it meets specification and rectifying any faults.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE) and use of appropriate supports
- relevant information on purposes, use and application of protective coating equipment and materials
- safety issues, adequate precautions and awareness of other site factors that could be affected by the work
- what constitutes deviation from a specified surface finish/condition and standard workplace procedures for identifying unsuitable work items
- method of locating areas to be protected from coating process and masked
- how to recognise areas subject to overspray and requiring protection

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- operation and maintenance of protective coating application plant and equipment using SOPs
- requirements for completion and processing of maintenance reports
- coating work piece assembly specifications and procedures
- procedures for identifying coating types and processing solvents, including mixing and safe handling practices
- procedures for determining the wet film thickness of a coating from the specified dry film thickness using calculations and a specified formulation
- procedures for thinning coating materials for use in applying the specified film thickness coating to a substrate
- procedures to apply protective coatings to comply with an established standard
- procedures for controlling coating application and curing techniques
- procedures for disassembly, cleaning, checking and storing/protecting coating equipment
- assessing the profile of the surface finish using procedures and other relevant standards
- features and use of dry film thickness testing instruments
- surface inspection procedures, including the extent and detail of inspection as required
- requirements for completion and processing of inspection reports
- manufacturers' specifications and procedures for inspecting and maintaining personal protective equipment in the workplace
- recording and reporting procedures for defective parts.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying protective coatings (basic) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

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MEM08015 Apply protective coatings (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM08015B Apply protective coatings (advanced)

Application

This unit of competency defines the skills and knowledge required to spray pre-treatments and protective coatings when an advanced level of skill is required. It includes inspection and interpretation of the coating results using all current industry knowledge and test equipment.

Where application of basic single and two pack coatings not containing isocyanates is required unit MEM08014 Apply protective coatings (basic) should be selected.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM08014	Apply protective coatings (basic)
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use and maintain appropriate personal protective equipment (PPE) in accordance with manufacturers' specifications and standard operating procedures
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Identify and interpret supplier information, product details, Australian and international standards, regulatory and legislative requirements relevant to the work to be undertaken
2	**Prepare to undertake work**	2.1	Select appropriate coating system and material to meet job specification
		2.2	Select appropriate coating process and equipment to meet job specification
		2.3	Prepare worksite for surface coating activities
3	**Prepare work piece for application of protective coating**	3.1	Inspect surface condition for readiness for application of protective coating according to specification
		3.2	Identify unsuitable work pieces/surfaces and fabrication defects and appropriate undertake remedial action or in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		3.3 Mask components where protective coating application is not specified
		3.4 Identify and account for conditions for overspray
4	**Prepare equipment for application of surface coating materials**	4.1 Apply required plant and equipment basic operations
		4.2 Undertake routine maintenance on plant and equipment in accordance with SOPs
		4.3 Record status/reports by proforma or orally in accordance with procedures
		4.4 Assemble coating application equipment in accordance with requirements
5	**Apply coatings using conventional, airless and plural component equipment**	5.1 Identify coating product type, solvent, uses, mixing procedure, clean-up and safety requirements, as appropriate
		5.2 Use the correct method of determining wet film thickness in accordance with specified dry film
		5.3 Thin coating material to suit the application method and to achieve required film thickness
		5.4 Apply coating using specified application method
		5.5 Monitor coating application and curing technique according to SOPs
6	**Clean and store equipment**	6.1 Clean and disassemble coating application equipment and inspect for damage
		6.2 Record and report faulty equipment to appropriate personnel in accordance with SOPs
		6.3 Store coating application equipment in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
7	**Inspect finished surface**	7.1	Assess surface finish for profile size differences and uses
		7.2	Determine coating thickness using appropriate instruments and compare results with job specifications
		7.3	Inspect total surface for conformance to specification in accordance with SOPs
		7.4	Record and report inspection results in accordance with SOPs
8	**Calculate, estimate and cost application of protective coating**	8.1	Assess surface area of work piece, materials, labour and equipment
		8.2	Determine cost of materials, labour, handling and equipment
		8.3	Record and report results as an estimate for the application of a protective coating system

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Protective coatings include one (1) or more of the following:	• conventional • two pack • plural component

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• Holiday and Pin Hole testing • wet and dry film thickness gauges • temperature • relative humidity and dew point • hardness • gloss • adhesion • cure testing • soluble salts

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08015B Apply protective coatings (advanced)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08015 Apply protective coatings (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM08015B Apply protective coatings (advanced)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, supplier information, product details, Australian and international standards, regulatory, legislative requirements and other applicable reference documents in applying protective coatings
- determining the correct coating method and application techniques for job
- preparing the surface to be coated, masking off, as required
- setting up, maintaining and using personal protective equipment (PPE) suitable for the coating work to be undertaken
- selecting, setting up and using coating application equipment and material
- adjusting coating material to provide the required finished surface coat, monitoring during application and testing that it meets specifications
- inspecting coated surface for required finish and recording test results
- cleaning, maintaining and storing coating equipment in accordance with procedures
- calculating the costs of coating work accurately.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications applying to protective coating work and the appropriate coating system and material required to meet job specification
- features of the various types of coating materials, including drying and curing requirements
- selection procedures for coating material and the appropriate coating process and equipment required for surface coating to meet job specification
- application features of the various types of coating materials and methods
- selection procedures for coating process and equipment, including conventional, airless and plural component

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- awareness of other site factors that could be affected by the coating work
- how to recognise deviation from specified surface finish/condition and standard workplace procedures for identifying unsuitable work items
- method of locating areas to be protected from coating process and masked
- areas subject to overspray and requiring protection
- operation of protective coating plant and equipment using SOPs
- procedures for routine maintenance of plant and equipment
- requirements for completion and processing maintenance reports
- protective coating inspection procedure to identify unsuitable work pieces in consideration of job specifications
- procedures for determining wet film thickness of a coating from the specified dry film thickness using calculations and a specified formulation
- procedures for thinning coating materials for use in applying the specified film thickness coating to a substrate
- procedures to apply protective coatings to comply with an established standard
- procedures for controlling coating application and curing techniques
- SOP for disassembly, cleaning and checking of protective coating equipment
- procedures for storage and protection of equipment
- procedures and other relevant standards for assessing the profile of the surface finish
- features and use of dry film thickness testing instruments
- procedures for surface inspection, including the extent and detail of inspection, as required, and requirements for completion and processing of inspection reports
- standard methods and procedures for determining surface area of various shapes of materials
- recording and reporting procedures for defective equipment components
- calculating, recording and reporting costs procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying protective coatings (advanced) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications

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- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM08016 Control blast coating by-products, materials and emissions

Modification History

Release 1. Supersedes and is equivalent to MEM08016B Control blast coating by-products, materials and emissions

Application

This unit of competency defines the skills and knowledge required to identify, evaluate and control blaster coating by-products, materials and emissions, including using common containment practices and waste removal processes.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 1

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Apply specific health and safety considerations to surface preparation**	2.1	Identify products, hazardous materials and processes used in blaster cleaning and coating operations
		2.2	Identify unsafe working conditions and report to appropriate personnel
3	**Control by-products, materials and emissions**	3.1	Contain by-products, materials and emissions using established procedures
		3.2	Monitor by-products, materials and emissions and direct to appropriate treatment or storage area
		3.3	Check monitoring devices for correct/continuous operation
		3.4	Record status and report in accordance with procedures
4	**Dispose of by-product, materials and emissions**	4.1	Apply waste treatment processes and in accordance with SOPs, as required
		4.2	Carry out treatment processes to meet relevant authority waste requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Monitoring devices include one (1) or more of the following:	• pH meters • probes
Waste treatment processes include one (1) or more of the following:	• neutralisation • metals precipitation • solid separation (gravity/centrifuging)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08016B Control blast coating by-products, materials and emissions

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08016 Control blast coating by-products, materials and emissions

Modification History

Release 1. Supersedes and is equivalent to MEM08016B Control blast coating by-products, materials and emissions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- safely and effectively control blaster cleaning by-products, materials and emissions
- monitoring blaster cleaning by-products, materials and emissions using suitable monitoring devices
- directing waste products to appropriate waste treatment area and processing and treating to meet relevant authority waste requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- products, hazardous materials and processes applying to blaster coating
- regulatory and legislative requirements relating to control of blast coating by-products, materials and emissions
- procedures for collecting samples and by-product collection equipment operation methods
- waste control monitoring equipment procedures and waste treatment processes
- requirements and procedures for recording and reporting processing status reports.

Assessment Conditions

- Assessors must:
  - have vocational competency in controlling blast coating by-products, materials and emissions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08018 Electroplate engineering coatings

Modification History

Release 1. Supersedes and is equivalent to MEM08018B Electroplate engineering coatings

Application

This unit of competency defines the skills and knowledge required to apply engineering metallic/ceramic coatings to ferrous and non-ferrous metals and some non-metallic materials, e.g. plastics.

It applies to producing engineering coatings designed to promote wear resistance, protect against corrosion, and reclaim worn components. It also applies to manufacturing components (electroforming).

Where pre-treatment operations only are required unit MEM08002 Pre-treat work for subsequent surface coating should be selected.

Where straightforward operation of electroplating process is required unit MEM08003 Perform electroplating operations should be selected.

Where surface preparation operations are required unit MEM08011 Prepare surfaces using solvents and/or mechanical means and unit MEM08012 Prepare surfaces by abrasive blasting (basic), should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where basic inspection of completed or partly completed products produced by others is required unit MEM15004 Perform inspection should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

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Where construction of anodes, shields/robbers is required appropriate fabrication units should also be selected.

Where dogging/lifting is required appropriate materials handling units to suit regulatory requirements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM07001	Perform operational maintenance of machines/equipment
MEM08001	Perform wire, jig and barrel load/unload work
MEM08003	Perform electroplating operations
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select treatments and processes/ equipment for producing engineering finishes**	2.1	Select appropriate treatment processes according to base metal type, the surface condition and relevant job specifications
		2.2	Select operating/process parameters to achieve required coating
		2.3	Select appropriate equipment, as required
3	**Prepare work for engineering finishes**	3.1	Mask (stop off) products for selective plating
		3.2	Construct conforming anodes and fit, where applicable
		3.3	Construct and fit shields and robbers, where applicable
		3.4	Carry out pre-treatment processes, where necessary
4	**Monitor and control operating conditions and processes for engineering coatings**	4.1	Set operating/process parameters to produce required surface conditions/specifications
		4.2	Monitor and confirm surface conditions of finished components and identify abnormalities
		4.3	Take corrective actions to rectify non-conforming conditions
5	**Maintain solutions for engineering**	5.1	Check solution compositions and confirm to specification/operating range
		5.2	Determine adjustment requirements/additions

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
finishes	5.3 Make additions to adjust solution composition to correct operating range as necessary

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Treatment processes include one (1) or more of the following:	• electroplating • electroforming • electroless plating
Operating/process parameters include one (1) or more of the following:	• treatment times and currents • bath pH temperatures and densities • anode conditions • addition agent content • cleanliness of contacts • make-up • maintenance of solution levels and purity
Coating includes one (1) or more of the following:	• hard chroming • heavy nickel • electroless nickel • nickel composites • heavy deposits of nickel, copper and bronze up to 10 mm
Equipment includes one	• wire racks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

(1) or more of the following:	• handling equipment • barrels • jigs • shields • robbers
Products include one (1) or more of the following:	Base materials, including: • cast iron • brass • steels with machine welded sections
Masking materials include one (1) or more of the following:	• wax • lacquers • tapes • foils
Anodes include one (1) or more of the following:	• soluble • insoluble auxiliary anodes
Solution compositions include one (1) or more of the following:	• cleaning • pickling • electroplating • chromate • acid dips
Checks include one (1) or more of the following:	• density • titration • pH
Adjustment includes one (1) or more of the following:	• strength of solutions • temperature range

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08018B Electroplate engineering coatings

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08018 Electroplate engineering coatings

Modification History

Release 1. Supersedes and is equivalent to MEM08018B Electroplate engineering coatings

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the composition of surfaces to be treated and selecting suitable methods and techniques for electroplated coating treatment
- preparing surfaces to be treated with pre-treatment process using masking and constructing/fitting shields/robbers, where necessary, and fitting anodes
- electroplating surfaces, monitoring the treatment process and adjusting solutions and operating parameters to meet specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- effects of plating process on different materials
- conditions affecting engineering finishes
- base metal types and the surface finish of untreated material
- mechanical/chemical and specialised electroplating pre-treatment processes
- process parameters for achieving different coatings
- characteristics of different surface finishes
- masking materials and masking techniques
- safe operation of equipment to produce engineering finishes
- current distribution principles
- methods of constructing/fabricating, fitting anodes and current capacity of conforming/auxiliary anodes
- role, construction, properties, applications, and positioning of shields and robbers
- finish requirements and permissible tolerances
- causes of electroplating process abnormalities and their related corrective actions
- purpose and application of simple tests including pH, titration and density
- calculations related to additions/adjustments to solution and of product surface area

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- procedures for safe handling of chemicals.

Assessment Conditions

- Assessors must:
  - have vocational competency in electroplating engineering coatings at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08019 Electroplate protective finishes

Modification History

Release 1. Supersedes and is equivalent to MEM08019B Electroplate protective finishes

Application

This unit of competency defines the skills and knowledge required to apply protective finishes using electroplating to household fittings, hardware, artefacts and accessories made from a range of ferrous and non-ferrous materials.

It includes pre-treatment, use of plating techniques, solutions and compositions for protective finishes, recognition and assessment of impurities and imperfections and associated corrective actions.

Processing may be manual, semi or fully automatic still or barrel plating environments and may include volume production and 'one-off' components.

Where pre-treatment operations only are required unit MEM08002 Pre-treat work for subsequent surface coating should be selected.

Where straightforward operation/monitoring of electroplating processes are required unit MEM08003 Perform electroplating operations should be selected.

Where surface preparation operations are required unit MEM08011 Prepare surfaces using solvents and/or mechanical means and unit MEM08012 Prepare surfaces by abrasive blasting (basic), should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where basic inspection of completed or partly completed products produced by others is required unit MEM15004 Perform inspection should also be selected.

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Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where construction of anodes, shields/robbers is required appropriate fabrication units should also be selected.

Where dogging/lifting is required appropriate materials handling units to suit regulatory requirements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM07001	Perform operational maintenance of machines/equipment
MEM08001	Perform wire, jig and barrel load/unload work
MEM08003	Perform electroplating operations
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select treatments and processes/ equipment for producing protective finishes**	2.1	Select treatment processes appropriate to the work requirements
		2.2	Select process parameters to achieve required finish
		2.3	Select appropriate equipment to achieve specified finish, as required
3	**Monitor and control protective finish processes and operating conditions**	3.1	Set operating/process parameters necessary to produce required protective finish/specifications
		3.2	Monitor and confirm surface condition of finished components and identify abnormalities
		3.3	Take corrective actions to rectify non-conforming conditions
		3.4	Carry out pre-treatment processes, where applicable
4	**Maintain solutions for protective finishes**	4.1	Check solution compositions and confirm to specification/operating range
		4.2	Identify adjustment requirements/additions
		4.3	Make additions to adjust solution composition to correct operating range
		4.4	Carry out purification procedures, as necessary
		4.5	Maintain anodes to ensure correct operation

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Maintain equipment for protective finishes**	5.1 Check performance of ancillary equipment and take remedial action, as necessary
	5.2 Maintain electrical contacts, anode condition and process transfer equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Treatment processes include one (1) or more of the following:	• zinc • zinc alloys • tin
Process parameters include one (1) or more of the following:	• dwell time • current density • current temperature
Equipment includes one (1) or more of the following:	• wire racks • handling equipment • barrels • jigs • shields • robbers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Operating process parameters include one (1) or more of the following:	• calculation and setting of treatment times and currents • bath pH • temperatures and densities • solution levels and compositions • purification procedures
Maintain solutions includes the following:	• typical tests for pH and concentration and calculation of adjustments to relevant solutions
Adjustment includes one (1) or more of the following:	• strength of solutions • temperature range
Anodes include the following:	• soluble and insoluble auxiliary anodes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08019B Electroplate protective finishes

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08019 Electroplate protective finishes

Modification History

Release 1. Supersedes and is equivalent to MEM08019B Electroplate protective finishes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the correct electroplating treatment, method and process for a range of ferrous and non-ferrous components to have a protective coating applied
- selecting, setting up and using electroplating equipment and masking up components to be plated, as necessary
- carrying out the electroplating process, monitoring solutions and other parameters, adjusting as necessary to meet the specified surface finish
- cleaning and maintaining electroplating equipment, reporting any faults.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- effects of plating process on different materials
- basic principles of chemistry, electro chemistry and metallurgy related to the process, including:
  - importance of maintaining satisfactory electrical contact
  - methods for detecting unsatisfactory contact
  - effects of build-up on cathode contacts
  - properties of different base materials
  - different pre-treatment processes and their application
  - process parameters and their relation to each other
  - differences between chromate conversion coatings
- types of defects, their causes and related corrective actions
- mechanical/chemical pre-treatment processes
- purpose and application of simple tests including ph and concentration
- operating parameters of solutions, including temperature, agitation rate and similar parameters

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- acceptable appearances for each stage of the electroplating operation and common abnormalities
- application of different equipment to the type of work processed and correct operation and cleaning requirements, including cleaning filters
- solutions, solution compositions and operating ranges for processes relative to protective finishes, including cleaning/pre-treatment, electroplating and post-treatment
- procedures for testing plate thickness
- safe working procedures for handling chemicals relative to protective finishes and for safely adding to baths
- procedures for measuring out materials, including use of scales and volumetric measurement devices
- level of impurities and permissible limits, effects of impurities and purification procedures for protective finish solutions
- different anode arrangements, including use of baskets and bags, and conforming anodes
- correct operation of anodes and appropriate remedial action
- effect of maintenance schedules on plant performance and performance requirements and basic maintenance checks for rectifier, bus bars, agitation, heating/cooling, extraction and tank linings.

Assessment Conditions

- Assessors must:
  - have vocational competency in electroplating protective finishes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM08020 Electroplate decorative finishes

Modification History

Release 1. Supersedes and is equivalent to MEM08020B Electroplate decorative finishes

Application

This unit of competency defines the skills and knowledge required to apply decorative finishes to household fittings, hardware, artefacts and accessories made from a range of ferrous and non-ferrous materials.

It includes pre-treatment, use of plating techniques, solutions and compositions for decorative finishes, recognition and assessment of impurities and imperfections and associated corrective actions.

Processing may be manual, semi or fully automatic still or barrel plating environments and may include volume production and 'one-off' components.

Where straightforward operation/monitoring of electroplating processes are required unit MEM08003 Perform electroplating operations should be selected.

Where surface preparation operations are required unit MEM08011 Prepare surfaces using solvents and/or mechanical means and unit MEM08012 Prepare surfaces by abrasive blasting (basic), should also be selected as appropriate.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where basic inspection of completed or partly completed products produced by others is required unit MEM15004 Perform inspection should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

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Where construction of anodes, shields/robbers is required appropriate fabrication units should also be selected.

Where dogging/lifting is required appropriate materials handling units to suit regulatory requirements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM07001	Perform operational maintenance of machines/equipment
MEM08001	Perform wire, jig and barrel load/unload work
MEM08003	Perform electroplating operations
MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Surface finishing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select treatments and processes/ equipment for producing decorative finishes**	2.1	Select appropriate treatment processes relevant job specifications
		2.2	Select mass treatment processes and carry out, where applicable
		2.3	Identify pre-plating treatments
		2.4	Select process parameters to achieve required coating
		2.5	Select appropriate equipment
3	**Monitor and control decorative finish processes and operating conditions**	3.1	Set operating parameters to produce required decorative finish/specifications
		3.2	Monitor and confirm plate appearance and final finish and identify abnormalities
		3.3	Take corrective actions to rectify non-conforming conditions
		3.4	Carry out pre-treatment processes, where applicable
		3.5	Check racks, jigs and barrels for correct loading
4	**Maintain solutions for decorative finishes**	4.1	Check solution compositions and confirm to specification/operating range
		4.2	Identify adjustment requirements/additions
		4.3	Make additions to adjust solution composition to correct operating range
		4.4	Carry out purification procedures, as appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		4.5 Maintain anodes to ensure correct operation
5	**Maintain equipment for decorative finishes**	5.1 Check performance of ancillary equipment and take remedial action, as necessary
		5.2 Maintain electrical contacts, anode condition and process transfer equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Decorative finishes include one (1) or more of the following:	• nickel • chrome • copper • silver • gold • rhodium
Treatment processes include one (1) or more of the following:	• pre-treatment • electroplating • electroforming • electroless plating • electrophoretic coating • post treatment plating out • carbon and chemical treatments for decorative finish solutions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

Pre-plating treatments include one (1) or more of the following:	• degreasing • soak/cleaning • electrolytic cleaning • activating dips
Equipment includes one (1) or more of the following:	• wire racks • handling equipment • barrels • jigs • shields • robbers
Operating parameters include one (1) or more of the following:	• calculation and setting of treatment times and currents • bath pH • temperatures and densities • agitation rate • process (deposition) time • solution levels and compositions • purification procedures
Abnormalities include one (1) or more of the following:	• poor/uneven brightness/texture • inadequate levelling • roughness • pitting • poor adhesion • blistering • burning • poor plate coverage (particularly chromium) • incorrect colour (particularly flash brass, gold)
Maintain solutions include the following:	• typical tests for pH density and titration and calculation of adjustments to relevant solutions
Solution compositions include one (1) or more of	• cleaning • pickling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, accessibility of the item, and local industry and regional contexts) are included.

the following:	• electroplating • chromate solutions • acid dips
Anodes include the following:	• soluble and insoluble auxiliary anodes
Process transfer equipment includes one (1) or more of the following:	• baskets • spreader bars • racks • hooks

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM08020B Electroplate decorative finishes

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM08020 Electroplate decorative finishes

Modification History

Release 1. Supersedes and is equivalent to MEM08020B Electroplate decorative finishes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the correct decorative finish electroplating treatment, method and process for a range of ferrous and non-ferrous components
- selecting, setting up and using electroplating equipment for decorative finishes and applying surface pre-treatment, as required
- carrying out the electroplating process, monitoring solutions and other parameters, adjusting as necessary to meet the specified surface finish
- cleaning and maintaining electroplating equipment, reporting any faults.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specific decorative electroplating pre-treatment processes (common base metals/soils and chemical/mechanical)
- effect of decorative treatment on different metals
- functions of strikes/activation treatment
- process parameters for decorative electroplating, including current computations
- effects of process parameters on performance
- post treatment processes
- relevant Australian standards for electroplating work
- application of different equipment to the type of work processed
- acceptable appearances including final specification/quality
- abnormalities in electroplating including types of defects and requirements for post treatment
- factors affecting plate distribution
- purpose and application of simple control tests
- calculations for additions/adjustments to decorative electroplating solutions

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- effects of adding chemicals too quickly
- purification procedures/treatments
- operation of anodes, arrangements and remedial action
- effects of build-up on cathode contacts, damage to rack coatings
- effect of maintenance schedules on plant performance and performance requirements and basic maintenance checks for rectifier, bus bars, agitation, heating/cooling, extraction and tank linings.

Assessment Conditions

- Assessors must:
  - have vocational competency in electroplating decorative finishes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM09002 Interpret technical drawing

Modification History

Release 1. Supersedes and is equivalent to MEM09002B Interpret technical drawing

Application

This unit of competency defines the skills and knowledge required to interpret technical drawings.

Technical drawings may utilise perspective, exploded views or hidden view techniques and may include symbol glossaries. Drawings are provided to AS 1100 Technical drawing or AS 1102 Graphical symbols and their equivalents from the full range of engineering disciplines.

Where any technical drawing, sketch, chart, diagram is only used as a technique for communication, then this unit does not apply: unit MEM12023 Perform engineering measurements or unit MEM16006 Organise and communicate information should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Drawing, drafting and design

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1.	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Identify job requirements from specifications, job sheets or associated work instructions
2.	**Interpret technical drawing**	2.1 Check drawing and version and validate against job requirements
		2.2 Recognise components and assemblies or objects
		2.3 Identify dimensions, instructions and material requirements
		2.4 Recognise symbols used in the drawing
		2.5 Compile list of required materials

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Drawing interpretation includes recognising the following:	• relationship between the views contained in the drawing • objects • units of measurement

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- dimensions of the key features
- symbols

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09002B Interpret technical drawing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09002 Interpret technical drawing

Modification History

Release 1. Supersedes and is equivalent to MEM09002B Interpret technical drawing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting, checking and validating technical drawing against job requirements or equipment
- interpreting technical drawing through recognition of components, assemblies, objects and symbols
- identifying dimensions
- applying drawing conventions appropriate to engineering discipline
- compiling a materials list.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- application of AS 1100 Technical drawing or AS 1102 Graphical symbols
- conventions used in technical drawings
- correct interpretation of instructions contained in drawings
- materials from which drawing object(s) are made and their features and manufacturing and assembly requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in interpreting technical drawings at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09003 Prepare basic engineering drawing

Modification History

Release 1. Supersedes and is equivalent to MEM09003B Prepare basic engineering drawing

Application

This unit of competency defines the skills and knowledge required to prepare basic engineering drawings across mechanical, electrical/electronic, fabrication and fluid power applications, and includes preparing new drawings or changing existing drawings. Manual and computer aided drafting and drawing equipment can be used. Preparation of parts lists and issuing of drawing documents is included.

Specifications for drawings are pre-determined and are obtained from design information, customer requirements, sketches and preliminary layouts.

Where a more extensive computer-aided design (CAD) system is used for design, unit MEM09009 Create 2-D drawings using computer-aided design system should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements and purpose of drawing from specifications, associated documents or work instructions
		1.5	Identify and collect all data necessary to produce the drawing
		1.6	Confirm drawing requirements and method with relevant personnel and establish timeframes for completion
2	**Prepare or make changes to engineering drawing**	2.1	Select drafting equipment appropriate to the drawing method chosen
		2.2	Apply drafting principles to produce a drawing that is consistent with SOPs, in consultation with supervisor, as required
		2.3	Ensure completed drawing is approved in accordance with SOPs
3	**Prepare engineering parts list**	3.1	Identify components parts and organise by component type in accordance with SOPs and customer requirements
4	**Issue drawing**	4.1	Complete drawings and parts lists records in accordance with SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.2 Copy approved drawings and parts lists and issue to relevant personnel
	4.3 Store approved drawings and parts lists, and catalogue in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Relevant personnel include one (1) or more of the following:	• technical personnel • supervisors • manufacturers • suppliers • contractors • customers
Drafting principles include the following:	• interpreting AS 1100.101-1992 (R2014) Technical drawing – General principles as required to prepare drawing • preparing drawings in accordance with AS 1100.101-1992 (R2014) Technical drawing – General principles, or equivalent, as required
Completing records include one (1) or more of the following:	• cataloguing • issuing security classifications • filing • preparing distribution lists

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Issued includes one (1) or more of the following:	• hard copy • photographic • slide or transparency form • presentation as a single drawing or with other drawings • presentation as a package

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09003B Prepare basic engineering drawing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09003 Prepare basic engineering drawing

Modification History

Release 1. Supersedes and is equivalent to MEM09003B Prepare basic engineering drawing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and confirming drawing requirements and purpose through consultation with relevant personnel, and establishing timeframes for completion
- setting up and using drafting equipment
- applying drafting principles in accordance with AS 1100.101-1992 (R2014) Technical drawing – General principles or equivalent
- resolving any issues in the preparation of engineering drawing in consultation with a supervisor
- undertaking numerical operations, geometry and calculations and formulae associated with preparing basic engineering drawings
- compiling an engineering parts list by component type
- issuing completed drawing and parts list to relevant personnel
- storing and cataloguing approved drawing and parts list in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- requirements and purpose of drawing and engineering parts list to be produced
- sources and standards of relevant data and information to which drawing is to be produced
- person(s) who can confirm drawing requirements and timeframe for completion
- method of drawing preparation and reasons for selecting the chosen drawing method
- procedures for:
  - producing an initial drawing
  - changing an existing drawing
  - checking and approving drawings and persons responsible
  - copying, issuing and recording approved drawings and or parts lists

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    - safe handling and storage and filing of drawings and/or parts lists and consequences of using inappropriate techniques
- drafting principles to be applied to the production and changing of a drawing
- consequences of inappropriate and incomplete components parts lists
- personnel to whom copies of approved drawings and or parts lists can be issued.

Assessment Conditions

- Assessors must:
    - have vocational competency in preparing basic engineering drawing at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM09004 Perform electrical or electronic detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09004B Perform electrical/electronic detail drafting

Application

This unit of competency defines the skills and knowledge required to produce or make changes to electrical or electronic drawings under supervision using manual drafting or drawing equipment. It applies to all electrical and electronic areas, with drawings completed to AS 1102 Graphical symbols, or equivalent, and in accordance with predetermined design specifications and instructions.

Where a computer-aided drafting (CAD) system is used unit MEM09009 Create 2-D drawings using computer-aided design system and MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09003	Prepare basic engineering drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare electrical or electronic drawings**	2.1	Draw schematic to indicate the relative positioning of electrical or electronic components
		2.2	Produce electrical or electronic drawings to include all relevant specifications
		2.3	Complete drawing to AS 1102 Graphical symbols or equivalent
3	**Determine component and material requirements**	3.1	Identify material and component requirements using design specifications
		3.2	Select required materials and components from supplier catalogues
4	**Complete documentation**	4.1	Complete drawings and associated documentation in accordance with SOPs
		4.2	Issue and store drawings and documentation in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Drawings include the following:

- plans
- schematics
- layouts
- circuit diagrams
- charts

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09004B Perform electrical/electronic detail drafting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09004 Perform electrical or electronic detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09004B Perform electrical/electronic detail drafting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing or making changes to electrical or electronic schematics and drawings to AS 1102 Graphical symbols, or equivalent, indicating relative positioning of components
- undertaking numerical operations, geometry, calculations and formulae associated with performing electrical or electronic detail drafting
- determining and selecting components and materials according to design specification
- completing documentation according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- relative position of electrical or electronic components
- symbols used in electrical or electronic schematics and drawings
- specifications of all components
- circuit specifications
- requirements of AS 1102 Graphical symbols or equivalent with respect to electrical or electronic schematics and drawings
- design specifications of the circuit and components
- appropriate components and materials from supplier catalogues
- reasons for selecting the chosen components and materials.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing electrical or electronic detail drafting at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09005 Perform basic engineering detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09005B Perform basic engineering detail drafting

Application

This unit of competency defines the skills and knowledge required to produce drawings to AS 1100 Technical drawing or equivalent using manual drafting or drawing equipment, where the critical dimensions, associated tolerances and design specifications are predetermined.

Where a computer-aided design (CAD) system is used unit MEM09009 Create 2-D drawings using computer-aided design system and MEM09010 Create 3-D models using computer-aided design system, should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09003	Prepare basic engineering drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Drawing, drafting and design

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare assembly, layout and detail drafting**	2.1	Prepare drawings in plane orthogonal, isometric projection or equivalent, including auxiliary views and sections to AS 1100 Technical drawing
		2.2	Prepare layout, assembly and component drawings from specifications
		2.3	Apply drawing dimensions and label using supplied tolerances in accordance with AS 1100 Technical drawing
		2.4	Produce drawings to specification in accordance with SOPs
		2.5	Use standard symbols to AS 1100 Technical drawing, or equivalent, to specify requirements
3	**Determine component and material requirements**	3.1	Identify component and material requirements according to design specifications
		3.2	Compile component and materials list
4	**Complete documentation**	4.1	Complete drawings and associated documentation in accordance with SOPs
		4.2	Store drawings and documentation in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

AS 1100 Technical drawing includes the following:	• interpretation under guidance, particularly in respect to any geometric tolerancing. AS 1100 Technical drawing is an extensive work and its application would usually be in line with SOPs

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09005B Perform basic engineering detail drafting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09005 Perform basic engineering detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09005B Perform basic engineering detail drafting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing layout, assembly and component drawings to AS 1100 Technical drawing in line with SOPs in plane orthogonal, isometric projection or equivalent, including auxiliary views and sections
- applying dimensions and labelling using supplied tolerances
- producing drawings to specifications using standard symbols to AS 1100 Technical drawing or equivalent
- undertaking numerical operations, geometry, calculations and formulae associated with performing basic engineering detail drafting
- compiling a component and materials list
- completing documentation according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- appropriate projection for the drawing purpose and reasons for selection
- reasons for including auxiliary views in drawings
- requirements of AS 1100 Technical drawing or equivalent with respect to dimensions, tolerances and labels
- procedures for producing component, layout and assembly drawings, and uses of drawings
- numerical operations, geometry, calculations and formulae associated with performing basic engineering detail drafting
- common symbols used in drawings to AS 1100 Technical drawing or equivalent
- design specifications of components
- appropriate components and materials from supplier catalogues and reasons for selection.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing basic engineering detail drafting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09006 Perform advanced engineering detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09006B Perform advanced engineering detail drafting

Application

This unit of competency defines the skills and knowledge required to use manual drafting and drawing equipment to produce assembly, layout and detail drawings to AS 1100 Technical drawing or equivalent.

Skills covered by this unit are applied individually or in a team environment where comprehensive responsibility for the production of the drawing is exercised, and critical dimensions and associated tolerances are determined as required.

Where a computer-aided design (CAD) system is used unit MEM09009 Create 2-D drawings using computer-aided design system and unit MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09003	Prepare basic engineering drawing
MEM09005	Perform basic engineering detail drafting
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements job sheets or other associated work instructions
2	**Prepare assembly, layout and detail drawing**	2.1	Determine specification requirements
		2.2	Undertake engineering calculations to determine all dimensions required to ensure functional operation and suitability
		2.3	Produce all drawings to AS 1100 Technical drawing or equivalent
3	**Select material, components or assemblies**	3.1	Select material, components or assemblies from data sheets or supplier catalogues to meet specifications
		3.2	Compile material, component or assembly list
4	**Check drawings**	4.1	Check drawings to ensure compliance with specifications
		4.2	Check drawings to ensure that assembly or fabrication is possible

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Dimensions include the following:	• limits and fits • surface texture • datum references • geometric tolerances

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09006B Perform advanced engineering detail drafting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09006 Perform advanced engineering detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09006B Perform advanced engineering detail drafting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing layout, assembly and detail drawings to AS 1100 Technical drawing or equivalent according to specifications including undertaking calculations to determine all dimensions appropriate to ensure functional operation and suitability
- undertaking numerical operations, geometry, calculations and formulae associated with performing advanced engineering detail drafting
- interpreting data sheets and supplier catalogues to select material, components or assemblies to meet specifications
- checking drawing for compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- specifications and requirements of the component, assembly or layout to be drawn
- numerical operations, geometry, calculations and formulae associated with performing advanced engineering detail drafting
- functional operation of the component or assembly to be drawn
- surfaces which are to be in contact or separated
- appropriate type of fit for contacting surfaces and reasons for selection
- effect of surface finish on the performance and operation of surfaces
- appropriate datum points
- procedures for determining all appropriate lineal, diametric and geometric tolerances
- requirements of AS 1100 Technical drawing or equivalent for the drawings to be produced
- specifications of the materials, components or assemblies
- appropriate components and materials from supplier catalogues and reasons for selection

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- procedures and reasons for checking the drawings to ensure that manufacturing or assembly is possible, efficient and cost effective
- drawing specifications
- methods of manufacture or assembly from the drawings
- unnecessary or inappropriate tolerances.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced engineering detail drafting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09007 Perform advanced mechanical detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09007B Perform advanced mechanical detail drafting

Application

This unit of competency defines the skills and knowledge required to use manual drafting or drawing equipment to produce mechanical assembly and layout detail drawings to AS 1100 Technical drawing or equivalent.

Skills covered by this unit are applied individually or in a team environment where comprehensive responsibility for the production of the drawing is exercised, and critical dimensions and associated tolerances are determined where required.

Where a computer-aided design (CAD) system is used unit MEM09009 Create 2-D drawings using computer-aided design system and unit MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

Where advanced structural detail drafting skills are required, unit MEM09008 Perform advanced structural detail drafting should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09003	Prepare basic engineering drawing
MEM09005	Perform basic engineering detail drafting
MEM09006	Perform advanced engineering detail drafting
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements job sheets or other associated work instructions
2	**Prepare mechanical detail drawings**	2.1	Produce all drawings to AS 1100 Technical drawing or equivalent
		2.2	Determine dimensions of various components and insert appropriate symbols for limits and fits, surface texture and geometric tolerances

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09007B Perform advanced mechanical detail drafting

Links

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Assessment Requirements for MEM09007 Perform advanced mechanical detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09007B Perform advanced mechanical detail drafting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- producing mechanical detail drawings to AS 1100 Technical drawing or equivalent including undertaking numerical operations, geometry and formula and calculations
- inserting appropriate symbols for all aspects of drawings including limits and fits, surface texture and geometric tolerances
- determining dimensions for various components to meet requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- the application of AS1100 Technical drawings or equivalent to mechanical detail drawings
- function of each component within the assembly or layout
- manufacturing, fabrication and assembly procedures to be used in producing the components or assemblies
- reason for ensuring that all components are correctly orientated to existing or proposed structures and services
- reasons for updating or modifying drawings to incorporate changes to specifications, production, assembly and fabrication methods and availability of standard hardware items.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced mechanical detail drafting at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09008 Perform advanced structural detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09008B Perform advanced structural detail drafting

Application

This unit of competency defines the skills and knowledge required to use manual drafting or drawing equipment to produce fabrication, structural assembly and layout drawings to AS 1100 Technical drawing or equivalent.

Skills covered by this unit are applied individually or in a team environment where comprehensive responsibility for the production of the drawing is exercised, and critical dimensions and associated tolerances are determined where required.

Where a computer-aided design (CAD) system is used unit MEM09009 Create 2-D drawings using computer-aided design system and unit MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

Where advanced mechanical detail drafting skills are required, unit MEM09007 Perform advanced mechanical detail drafting should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements job sheets or other associated work instructions
2	**Prepare structural detail drawing**	2.1	Produce all drawings to AS 1100 Technical drawing or equivalent
		2.2	Determine dimensions of various components and insert appropriate symbols for limits and fits, surface texture and geometric tolerances

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09008B Perform advanced structural detail drafting

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Links

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Assessment Requirements for MEM09008 Perform advanced structural detail drafting

Modification History

Release 1. Supersedes and is equivalent to MEM09008B Perform advanced structural detail drafting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- producing structural detail drawings to AS 1100 Technical drawing or equivalent, including undertaking numerical operations, geometry and formula and calculations
- inserting appropriate symbols for all aspects of drawings including limits and fits, surface texture and geometric tolerances
- determining dimensions for various components to meet requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- the application of AS1100 Technical drawings or equivalent to structural detail drawings
- function of each component within the assembly or layout
- manufacturing, fabrication and assembly procedures to be used in producing the components or assemblies
- reason for ensuring that all components are correctly orientated to existing or proposed structures and services
- reasons for updating or modifying drawings to incorporate changes to specifications, production, assembly and fabrication methods and availability of standard hardware items.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced structural detail drafting at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09009 Create 2-D drawings using computer-aided design system

Modification History

Release 1. Supersedes and is equivalent to MEM09009C Create 2D drawings using computer aided design system

Application

This unit of competency defines the skills and knowledge required to produce 2-D drawings using a computer-aided design (CAD) system. Skills include producing linked bills of material, file management and associated customisation of installed software, including the use of macros, menus and default settings. 2-D drawings can be produced from 3-D models created using CAD system.

The unit primarily applies to the fields of mechanical, electrical or electronic, fabrication and fluid power.

This unit covers CAD skills only. Where detail drafting skills are required see the following units:

- MEM09004 Perform electrical or electronic detail drafting
- MEM09005 Perform basic engineering detail drafting
- MEM09006 Perform advanced engineering detail drafting

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare CAD environment**	2.1	Customise system variables, menus and drawing defaults to suit standard operating procedures
		2.2	Develop macros to specifications
3	**Create 2-D drawings**	3.1	Create drawings using the available software system
		3.2	Link drawing entities to database attributes to suit job requirements
		3.3	Create detailed views using various scales to meet job requirements
4	**Produce output**	4.1	Save files in various formats according to procedures
		4.2	List linked entities in a bill of materials format to meet job requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Extract supplementary data from drawing to meet job requirements, as necessary

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Drawing includes one (1) or more of the following:	• plans • diagrams • charts • electrical or electronic circuits
File formats include one (1) or more of the following:	• IGES • DXF • HPGL
Entities mean any single item created on the screen and include one (1) or more of the following:	• lines • arcs • circles • text • hatch • dimensions
Attributes include mean properties associated with an	• layer • level

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

entity and include one (1) or more of the following:	• line type • line width • colour • text type
Supplementary data includes one (1) or more of the following:	• area • lengths • angles • perimeters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09009C Create 2D drawings using computer aided design system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09009 Create 2-D drawings using computer-aided design system

Modification History

Release 1. Supersedes and is equivalent to MEM09009C Create 2D drawings using computer aided design system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing computer-aided design (CAD) systems to create 2-D drawings by customising system variables, menus and drawing defaults and developing macros to specifications and SOPs
- creating 2-D drawings using CAD with the full capacity of the software system and linking drawing entities
- undertaking numerical operations, geometry and calculations or formulae associated with creating 2-D drawings using CAD system
- linking entities to data attributes including mean properties associated with an entity and creating detailed views using appropriate scales to suit specifications
- producing and saving files in various formats, listing link entities in a bill of materials format and extracting supplementary data from drawing to meet job requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- CAD software system
- system variables that can be customised
- procedures for:
  - customising identified system variables and reasons why
  - customising menus, system defaults and developing macros and reasons why
  - linking drawing entities to database attributes
  - printing drawing files
  - creating additional views of the object being drawn
  - saving drawing files
  - producing bills of material

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    - extracting data with respect to drawn shapes and features
- applicable drafting standards and procedures
- drawing features of the CAD software system
- reasons for using specialised software features
- appropriate drawing scales
- various formats in which drawing files can be saved and reasons for using different formats when saving drawing files
- properties of shapes, sections and features that can be extracted from the drawing file.

Assessment Conditions

- Assessors must:
    - have vocational competency in creating 2-D drawings using computer-aided design system at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09010 Create 3-D models using computer-aided design system

Modification History

Release 1. Supersedes and is equivalent to MEM09010C Create 3D models using computer aided design system

Application

This unit of competency defines the skills and knowledge required to prepare the 3-D computer-aided design (CAD) environment, create and modify 3-D models, and produce output from the 3-D model using computer equipment and industrial software. It applies to the fields of mechanical, electrical or electronic, fabrication and fluid power.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09009	Create 2-D drawings using computer-aided design system
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Drawing, drafting and design

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare 3-D environment**	2.1	Establish coordinate system to meet job requirements
		2.2	Establish orientation and views
3	**Create and modify 3-D model**	3.1	Create and manipulate entities in 3-D space
		3.2	Create surfaces in 3-D space to job requirement, including ruled and revolved
		3.3	Modify existing 3-D model
4	**Produce output from 3-D model**	4.1	Save file in various formats for retrieval in accordance with SOPs
		4.2	Extract physical properties to job requirement

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Entities include one (1) or more of the following:

- arcs
- lines
- spheres
- cones
- cylinders
- boxes

Physical properties include the following:

- volume
- mass
- centre of gravity

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09010C Create 3D models using computer aided design system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09010 Create 3-D models using computer-aided design system

Modification History

Release 1. Supersedes and is equivalent to MEM09010C Create 3D models using computer aided design system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing computer-aided design system (CAD) to create 3-D models, including establishing coordinate system, orientation and views to specifications and job requirements
- creating and modifying 3-D models using CAD by creating and manipulating entities in 3-D space, creating ruled and revolved surfaces and modifying existing 3-D model to suit job requirements
- undertaking numerical operations, geometry and calculations or formulae associated with creating 3-D models using CAD system
- producing and saving files in various formats for retrieval and extracting physical properties to meet job requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- purpose for which the 3-D model is to be developed
- reasons for selecting the appropriate coordinate system for the job
- orientation of the model with respect to the coordinate system
- number of views required to establish the model
- procedures for:
  - creating and manipulating entities in 3-D space
  - modifying existing 3-D models
  - saving drawing files
  - extracting data with respect to the physical properties of shapes created in 3-D space
- entities that can be created and manipulated in 3-D space
- applications and procedures for creating ruled and revolved surfaces in 3-D space

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- various formats in which drawing files can be saved and reasons for using different formats when saving drawing files
- physical properties of shapes created in 3-D space that can be extracted from the drawing file.

Assessment Conditions

- Assessors must:
  - have vocational competency in creating 3-D models using computer-aided design system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09011 Apply basic engineering design concepts

Modification History

Release 1. Supersedes and is equivalent to MEM09011B Apply basic engineering design concepts

Application

This unit of competency defines the skills and knowledge required to apply in situ design skills to determine design requirements and create a design for application within the engineering fields of mechanical, production, electrical or electronic, fabrication and fluid power. Design concepts may be applied to the fabrication and modification of structures, plant and equipment, and design of tooling and gauges, production control systems, fluid power layouts and electrical circuits.

This unit is suitable for application by personnel who are responsible for the manufacture of the design outcome, either individually or as part of a team.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Drawing, drafting and design

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify design requirements from specifications, job sheets or associated work instructions
2	**Determine design concepts**	2.1	Establish design concepts with regard to design considerations
		2.2	Consult codes, regulations and technical documentation to establish design limitations in accordance with SOPs, where appropriate
		2.3	Identify sources of expert assistance and use, as required
3	**Create design**	3.1	Ensure design meets end use requirement
		3.2	Ensure design meets all legislative and regulatory requirements
		3.3	Verify design concept in accordance with SOPs
		3.4	Produce design outcome in accordance with job requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Design considerations include one (1) or more of the following:

- location
- assembly requirements
- process
- material
- quantity
- cost
- outcome
- impact of the design on other equipment, processes or personnel

Design outcome includes one (1) or more of the following:

- sketch
- drawing
- prototype
- document
- model
- finished product

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09011B Apply basic engineering design concepts

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM09011 Apply basic engineering design concepts

Modification History

Release 1. Supersedes and is equivalent to MEM09011B Apply basic engineering design concepts

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining design requirements to establish design concepts
- consulting on relevant codes, regulations, and technical documentation in consultation with appropriate personnel to establish design limitations and verifying design
- creating design concepts to meet requirements
- undertaking numerical operations, geometry and formula and calculations to ensure design meets end use requirement whilst complying with all legislative and regulatory requirements
- producing design outcome to meet end use requirement.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- design requirements
- functional requirements of the design
- materials appropriate to the environment in which the object to be designed is to operate
- processes to be used and the costs associated in the manufacture of the object
- reasons for selecting the chosen design concept
- all relevant codes, standards and regulations applying to the object to be designed and the impact on the design requirements
- sources of expert assistance in the design process
- end-use requirements of the design
- checks to ensure the design complies with the relevant codes, standards, legislative and regulatory requirements
- procedures for verifying design concepts

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- means by which the design concept is to be presented and requirements for achieving design outcome.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying basic engineering design concepts at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09021 Interpret and produce drawings of curved 3-D shapes

Modification History

Release 1. Supersedes and is equivalent to MEM09021B Interpret and produce curved 3-dimensional shapes

Application

This unit of competency defines the skills and knowledge required to produce and interpret lines plan drawings manually or using computer-aided design (CAD) equipment complying with industry standards.

It applies to drawing and lofting principles used to produce lines plan drawings and loftings and common applications of this unit are in marine vessel construction.

In a marine setting, tasks may relate to drawings for hull designs, section development, including curved and raking transom, conical development and camber development methods.

Where a CAD system is used for basic drawing unit MEM09003 Prepare basic engineering drawing should also be selected.

Where more extensive CAD system is used for design unit MEM09009 Create 2-D drawings using computer-aided design system should be selected.

Where straightforward take-offs from lofted drawings, or where transfer of lines to lofting floor or other surface is required to be carried out, unit MEM12007 Mark off/out structural fabrications and shapes should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015 Work safely and effectively in manufacturing and engineering

MEM16006 Organise and communicate information

Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify design requirements from specifications, job sheets or associated work instructions
2	**Apply drawing procedures**	2.1	Determine and outline lines drawing procedures and identify data requirements
		2.2	Set up appropriate drawing equipment to suit requirements
		2.3	Apply drawing procedures to suit specified drawing
		2.4	Record any alterations to offset measurements, where applicable
		2.5	Ensure drawings are consistent with operation procedures and industry requirements
3	**Submit lines plan drawings**	3.1	Submit completed drawings in accordance with industry standards
		3.2	Supply altered offset measurements and relevant drawing information, where applicable

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements include one (1) or more of the following:	• client brief • industry standards • survey specifications
Submitted includes to one (1) or more of the following:	• client • supervisor • boat builder/ship builder • surveying authority
Industry standards relate to one (1) or more of the following:	• accuracy • design • layout • tabulation of offsets • material specification • construction specifications • quality of presentation of drawings

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09021B Interpret and produce curved 3-dimensional shapes

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Links

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Assessment Requirements for MEM09021 Interpret and produce drawings of curved 3-D shapes

Modification History

Release 1. Supersedes and is equivalent to MEM09021B Interpret and produce curved 3-dimensional shapes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining drawing requirements
- applying drafting procedures to produce curved 3-D shapes using appropriate drawing equipment ensuring they are consistent with operation procedures and industry requirements
- undertaking numerical operations, geometry, calculations and formula associated with interpreting and producing curved 3-D shapes
- submitting completed drawings to applicable personnel and supplying altered offset measurements and all relevant information.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- vessel design characteristics, including performance, stability and construction methods
- data requirements for producing lines plan drawings
- numerical operations, geometry, calculations and formulae
- spatial concepts
- drawing techniques and procedures and use of equipment
- industry standards, terminology and symbols applying to lines plan drawings.

Assessment Conditions

- Assessors must:
  - have vocational competency in interpreting and producing curved 3-D shapes at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM09022 Create 2-D code files using computer-aided manufacturing system

Modification History

Release 1. Supersedes and is equivalent to MEM09022A Create 2D code files using computer aided manufacturing system

Application

This unit of competency defines the skills and knowledge required to produce 2-D computer-aided manufacturing (CAM) code files from existing computer-aided design (CAD) model. It includes managing files and tools, and customising installed software.

The unit typically applies in a manufacturing setting where components are machined or processed within a CAM environment.

Where 2-D CAD models are required to be produced unit MEM09009 Create 2-D drawings using computer-aided design system should also be selected.

Where components are machined following development of code files then appropriate computer numerically controlled (CNC) machining units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM16008 Interact with computing technology

Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare for computer aided manufacture**	2.1	Customise system variables, user interface and software defaults to suit procedures
		2.2	Develop manufacturing data according to procedures
3	**Manipulate 2-D models**	3.1	Import models using a variety of file formats
		3.2	Orient and manipulate models using the full capability of the software system
		3.3	Link model entities to database attributes to suit job requirements
		3.4	Apply manufacturing data to detailed models to suit various applications and job requirements
4	**Produce output from 2-D model**	4.1	Save files in a variety of formats according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.2 Verify CAM model for logical sequencing and correct manufacturing procedures
	4.3 Produce code from the 2-D CAM model

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customising includes the use of one (1) or more of the following:	• macros • menus • default settings
Entities refer to any single item created on the screen and include one (1) or more of the following:	• lines • arcs • circles • text
Attributes are properties associated with an entity and include one (1) or more of the following:	• layer • level • line type • colour • text

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09022A Create 2D code files using computer aided manufacturing system

Links

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Assessment Requirements for MEM09022 Create 2-D code files using computer-aided manufacturing system

Modification History

Release 1. Supersedes and is equivalent to MEM09022A Create 2D code files using computer aided manufacturing system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing for computer-aided manufacture (CAM) by customising system variables, user interface and software defaults and developing manufacturing data to suit specifications and procedures
- importing 2-D models using various file formats, orienting and manipulating them and linking model entities to data attributes
- applying manufacturing data to detailed models to suit requirements
- producing and saving files in various formats and verifying CAM model for logical sequencing and correct manufacturing procedures
- producing code from completed 2-D CAM model.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- model features of the CAM software system
- operation of the CAM software system
- system variables and procedures for customising user interface and system defaults
- procedures for developing macros
- procedures for linking model entities to database attributes
- CAD file conversion
- CAM file formats
- procedures for saving and managing CAM files.

Assessment Conditions

- Assessors must:

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  - have vocational competency in creating 2-D code files using computer-aided manufacturing system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM09023 Create 3-D code files using computer-aided manufacturing system

Modification History

Release 1. Supersedes and is equivalent to MEM09023A Create 3D code files using computer aided manufacturing system

Application

This unit of competency defines the skills and knowledge required to produce 3-D computer-aided manufacturing (CAM) code files from existing computer-aided design (CAD) models or from data collected by sample measurement. It includes managing files and tools and customising installed software.

This unit typically applies in a manufacturing setting where components are machined or processed within a CAM environment.

Where a CAD system is also used then unit MEM09009 Create 2-D drawings using computer-aided design system and unit MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

Where components are machined following development of code files then appropriate computer numerically controlled (CNC) machining units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM09022	Create 2-D code files using computer-aided manufacturing system
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Drawing, drafting and design

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or associated work instructions
2	**Prepare 3-D environment**	2.1	Customise system variables, user interface and software defaults to suit job requirements
		2.2	Establish coordinate system, orientation and views according to job requirements
3	**Manipulate 3-D models**	3.1	Import models using a variety of file formats
		3.2	Orient existing 3-D models and manipulate to job requirements
		3.3	Link model entities to database attributes to suit job requirements
		3.4	Develop manufacturing data from the 3-D CAM model

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Produce output and manage 3-D code files**	4.1 Save files in a variety of formats for retrieval according to SOPs
	4.2 Verify CAM model for logical sequencing and correct manufacturing procedures
	4.3 Produce code from the 3-D CAM model

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customising includes the use of one (1) or more of the following:

- macros
- menus
- default settings

Entities include one (1) or more of the following:

- lines
- arcs
- primitives, including:
  - spheres
  - surfaces
  - solids
  - cones
  - cylinders
  - boxes

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09023A Create 3D code files using computer aided manufacturing system

Links

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Assessment Requirements for MEM09023 Create 3-D code files using computer-aided manufacturing system

Modification History

Release 1. Supersedes and is equivalent to MEM09023A Create 3D code files using computer aided manufacturing system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing to produce 3-D computer-aided manufacture (CAM) code files by coordinating system, orientation and views to suit specifications and procedures
- importing 3-D models using various file formats and orienting and manipulating them, and linking model entities to data attributes to suit job requirements
- developing manufacturing data from 3-D CAM model to suit requirements
- producing and saving files in various formats for retrieval and verifying CAM model for logical sequencing and correct manufacturing procedures
- producing code from completed 3-D CAM model.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- coordinate systems
- orientation of the model with respect to the coordinate system
- procedures for customising system defaults and user interface
- entities that can be manipulated in 3-D space
- procedures for manipulating entities in 3-D space
- procedures for using the post processor
- procedures for saving and storing CAM files
- CAD file conversions
- CAM file formats.

Assessment Conditions

- Assessors must:

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  - have vocational competency in creating 3-D code files using computer-aided manufacturing system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10001 Erect structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10001 Erect structures (Release 1).

Release 1. Supersedes and is equivalent to MEM10001C Erect structures.

Application

This unit of competency defines the skills and knowledge required to inspect and prepare the erection site, erect structures and applies to structures that are exclusively/predominantly steel metal and are load-bearing of substantial size made out of steel and/or other metals.

Specifications for the structure would be supplied via engineering drawings or the like and would include site location information.

Where workshop assembly techniques are required see unit MEM05011 Assemble fabricated components.

Where design skills are required see unit MEM09011 Apply basic engineering design concepts.

Where lifting or rigging skills are required see appropriate units.

Where welds are required to meet legislative or regulating requirements then see appropriate welding units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05007 Perform manual heating and thermal cutting

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MEM05051	Select welding processes
MEM05052	Apply safe welding practices
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Plus, one or more of the following, including their prerequisites:

MEM05015	Weld using manual metal arc welding process
MEM05017	Weld using gas metal arc welding process

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and prepare erection site**	2.1	Check site for correct location, dimensions and levels
		2.2	Report non-compliance with specifications to appropriate authority
		2.3	Undertake minor alterations, corrections or adjustments with approval of appropriate authority
		2.4	Prepare all surfaces and materials/components for use
		2.5	Identify and check structure components against specifications
3	**Erect structures**	3.1	Carry out all work in a safe manner and in accordance with defined procedures
		3.2	Prepare structure components for correct sequential erection
		3.3	Erect components and fix according to specifications
		3.4	Adjust structures to specifications
		3.5	Ensure all reports and documentation is completed to required specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Levels include the following:	• straightforward levelling and alignment using plumb bob/lines and levels
Appropriate authority includes one (1) or more of the following:	• site supervisor • building inspector • contractor

Materials/components include one (1) or more of the following:	• ferrous and non-ferrous materials of a:
	  • variety of material sizes
	  • variety of borne loads
	  • variety of joining systems
	  • variety of component profiles

Prepared includes one (1) or more of the following:	• cleaning • assembly sequencing • surface finishing
Structures include one (1) or more of the following:	• metal frameworks • portals • stairways • walkways • vessels • tanks • platforms • conveyors • moving lines • associated railings
Reports and documentation include one (1) or more of the following:	• contract documents • building inspection documentation • compliance reports

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM10001 Erect structures (Release 1).

Release 1. Supersedes and is equivalent to MEM10001C Erect structures.

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Links

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Assessment Requirements for MEM10001 Erect structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10001 Erect structures (Release 1).

Release 1. Supersedes and is equivalent to MEM10001C Erect structures.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for erecting structures for on-site or off-site locations
- ensuring the site is level and prepared to specifications
- preparing structural components for correct sequential erection
- erecting structures and adjusting structures to specifications
- completing all reports and documentation and compliance reports to required specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- site management requirements
- site preparation and levelling requirements
- range of technique/equipment which can be used to check the site levels
- procedures to be followed if the location, dimensions and/or levels of the site do not comply with specifications
- procedures for making a range of alterations/corrections using appropriate methods/techniques
- procedures for checking the components of the structure
- legislative and regulatory guidelines
- materials specifications, applications, properties and characteristics
- correct erection sequence
- methods and selection of fixing/fastening the components of the structure
- methods and selection of lifting/moving the components of the structure
- methods and selection of locating/holding the components

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- adjustments which can be made to bring the structure into specification
- approval process for final alterations
- procedures for checking the structure for conformance and procedures to be followed if the structure does not comply
- procedures for completing required documentation and compliance reports.

Assessment Conditions

- Assessors must:
  - have vocational competency in erecting structures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM10002 Terminate and connect electrical wiring

Modification History

Release 1. Supersedes and is equivalent to MEM10002B Terminate and connect electrical wiring

Application

This unit of competency defines the skills and knowledge required to terminate, disconnect or reconnect electrical wiring, including all types of cords and cables and circuits, excluding specialist cables.

All testing is undertaken on completed circuits where these are not connected to main supply, using appropriate methods including continuity and resistance checks.

Where soldering/desoldering of electrical/electronic components is required see unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components and unit MEM05002 Perform high reliability soldering and desoldering, as appropriate.

Where termination and connection of specialist cables such as mineral insulated, steel wire and armoured cables is required see unit MEM10011 Terminate and connect specialist cables.

This unit does not cover the competencies required for energising and testing of the circuit.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12002	Perform electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for electrical wiring termination and connection**	2.1	Undertake all work safely and to workplace procedures and state/territory regulations and legislative requirements
		2.2	Check materials for correct specifications
		2.3	Undertake preparation of work or check/inspect for correct location and specifications of cable trays, brackets and trenches
3	**Connect electrical wiring**	3.1	Ensure terminations/connections are made to specifications, manufacturers' requirements and to safety and state/territory regulations and legislative requirements
		3.2	Adjust and fix all brackets, clamps and holders to specifications
		3.3	Ensure all cables, wires, conductors and connections are marked/tagged and labelled to specification

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Test terminated cables to ensure continuity and insulation resistance readings comply with requirements
	3.5 Complete all reports and documentation correctly to required specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical wiring includes one (1) or more of the following:	• wiring associated with:
	  • control wiring
	  • machinery
	  • other electrical apparatus

Terminations/connections include one (1) or more of the following:	• clamping • crimping • pin connection • soldered joints • plugs • sockets • clamping of cables and wires and sealing entry points where required

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10002B Terminate and connect electrical wiring

Links

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Assessment Requirements for MEM10002 Terminate and connect electrical wiring

Modification History

Release 1. Supersedes and is equivalent to MEM10002B Terminate and connect electrical wiring

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, regulatory and legislative requirements for terminating and connecting electrical wiring
- connecting and terminating electrical wiring utilising a range of methods and sealing entry points, where required, and marking/tagging and labelling wiring to specifications
- using test equipment to locate various faults
- inspecting and testing terminated cables to ensure they comply with continuity and insulation resistance and are safely intended for use
- completing all reports and documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- statutory and regulatory requirements associated with the termination and connection of electrical wiring including AS/NZS 3000:2000, Electrical Installations (known as the Australian/New Zealand Wiring Rules), other Australian/International Standards and codes of practice
- different types of electrical cables and cords and their applications
- structural components of cables and their purpose (conductor material, stranding, insulation type, voltage rating, screening, sheathing, armour and serving)
- identifying the Australian and international colour standards for cables and cords
- factors affecting cable current-carrying capacity including current requirements for the circuit, cable installation method to be used and environmental conditions in the vicinity of cable installation
- wiring support and/or protection requirements and specifications
- relevant manufacturer requirements
- specifications and methods for terminating different materials

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- wiring support techniques and alternatives
- marking, tagging and labelling requirements for cables, wires, conductors and connections
- test requirements to ensure compliant continuity and insulation resistance
- data to be recorded/reported and the frequency of recording/reporting
- requirements for approval to work.

Assessment Conditions

- Assessors must:
  - have vocational competency in terminating and connecting electrical wiring at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10003 Install and test electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM10003B Install and test electrical wiring and circuits up to 1000 volts a.c and 1500 volts d.c

Application

This unit applies engineering tradesperson involved in installation of electrical wiring/systems and/or enclosures, including specialist cables, using a full range of installation materials and techniques to any wiring circuits which are directly or indirectly connected to a power supply system of electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c used for heating, ventilation, air conditioning and refrigeration (HVAC/R).

The scope of work includes modifying existing electrical work and electrical equipment work to relevant specifications/regulations and drawings.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **12**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

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Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Ensure emergency first aid equipment, documentations and procedures are in place and understood
		1.4	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.5	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan the installation**	2.1	Determine special work, hazard and safety requirements and incorporate in plan
		2.2	Devise work plan/strategy and confirm in accordance with legislative and regulatory requirements and procedures
3	**Prepare for electrical installation**	3.1	Undertake all work safely and to workplace procedures, state/territory regulations and legislative requirements
		3.2	Check materials for correct specifications
		3.3	Determine the need to test or measure live in strict accordance with WHS requirements and when necessary conducted within established safety procedures
		3.4	Check that circuits/machines/plant is isolated where necessary in strict accordance WHS requirements and procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Install the wiring/enclosures and/or support systems**	4.1	Ensure all cables/conductors/conduit/enclosures and support systems are installed to specifications using correct appropriate techniques, tools and equipment
		4.2	Terminate cables and conductors to accessories and appliances in accordance with manufacturer's specifications and regulatory requirements
		4.3	Mark cabling or label for identification and to specification
5	**Commission and test the installed wiring system**	5.1	Test all completed wiring/systems and enclosures for compliance with specifications, regulations, and legislative requirements, utilising appropriate test procedures and equipment
		5.2	Energise the installation and test for compliance with specifications
		5.3	Rectify faults as required to meet specification
		5.4	Complete documentation to required specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Installation includes the following:	• electrical installation work and electrical equipment work 1000 volts a.c. and 1500 volts d.c. to existing HVAC/R system and involving utilisation of a range of methods,

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	tools and equipment appropriate to the work
Specifications/regulations and drawings include one (1) or more of the following:	• legislative acts • Wiring Rules • other standards • specifications • electrical and architectural drawings
Cables/conductors include one (1) or more of the following:	• single insulated • thermoplastic insulated and sheathed • flat and circular • MIMS • steel wire armoured • flexible cords and cables • copper and aluminium • catenary systems • shielded
Conduit/enclosures include the following:	• metallic and non-metallic
Support systems include one (1) or more of the following:	• trunking • ducting • cable tray/ladder • catenaries
Documentation includes one (1) or more of the following:	• work documentation • short reports required to meet regulatory requirements • safe work method statements (SWMS) • job safety analysis (JSA) • work permits

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10003B Install and test electrical wiring and circuits up to 1000 volts a.c and 1500 volts d.c

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Assessment Requirements for MEM10003 Install and test electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM10003B Install and test electrical wiring and circuits up to 1000 volts a.c and 1500 volts d.c

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking emergency first aid equipment, documentations and procedures are in place according to site/legislative requirements
- using appropriate personal protective equipment (PPE) in accordance with site/legislative requirements
- identifying and interpreting specifications and drawings for installing and testing electrical wiring and circuits for existing heating, ventilation, air conditioning and refrigeration (HVAC/R) system
- coordinating the installation effectively with others affected by the work in accordance with legislative and customer requirements
- checking materials conform to specifications and customer requirements
- assessing the need the need to test or measure live in strict accordance with work health and safety (WHS) requirements, and when necessary, conducting within established safety procedures
- ensuring HVAC/R system is isolated where necessary in strict accordance with WHS requirements
- planning the cable routes and obtaining the installation materials including accessories and appliances
- installing the wiring, including routing, placing and securing cables in compliance with requirements
- terminating cables and conductors to accessories and appliances in accordance with manufacturer specifications and regulatory requirements
- marking or labelling cabling as required to specification
- inspecting and testing installed and terminated circuits and rectifying any defects and retesting to ensure compliance
- documenting ‘as installed’ wiring, accessories and appliances in accordance with established procedures and regulatory requirements.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- work permit requirements, including safe work method statement (SWMS) or job safety analysis (JSA)
- statutory and regulatory requirements associated with the installing and testing of electrical wiring and circuits, including AS/NZS 3000:2000 Electrical Installations (known as the Australian/New Zealand Wiring Rules), other Australian/International Standards and codes of practice
- AS/NZS 3008.1.2:2010 Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV and other related standards in regard to the cable selection/support fit for purpose
- other legislative and regulatory requirements appropriate to the work to be done
- work planning procedures
- procedures to be followed if materials and or supports do not conform to specification
- techniques, tools and equipment required to install cables, wires, conduit, enclosures and support systems
- marking and/or labelling requirements for cabling and reasons for marking and/or labelling cables
- procedures and equipment to test before and after energising wiring and systems
- reasons for carrying out all tests
- common wiring system faults and method(s) for rectifying faults
- documentation to be completed
- dangers present in electrical rescue
- local emergency services
- appropriate standards and procedures for recording of first aid treatment
- recognised procedures for the movement and treatment of injured persons
- requirements for approval to work.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing and testing electrical wiring and circuits up to 1000 volts a.c and 1500 volts d.c used in existing HVAC/R systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM10004 Enter and change programmable controller operational parameters

Modification History

Release 1. Supersedes and is equivalent to MEM10004B Enter and change programmable controller operational parameters

Application

This unit of competency defines the skills and knowledge required to enter and change programmable controller operational parameters.

Work is generally undertaken at location of programmable controllers including, programmable logic controller (PLC) and distributed control system (DCS) or similar devices but could be undertaken with data link offsite.

Where the selection and use of engineering measuring equipment is required see unit MEM12023 Perform engineering measurements.

Where routine downloading of PLC, robot, computer numerically controlled (CNC) or numerically controlled (NC) programs from disk, tape or direct means not requiring program or data adjustment or checks against specification is required see unit MEM16008 Interact with computing technology.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

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Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Install program**	2.1	Download software, as required
		2.2	Undertake appropriate checks during and after downloading to ensure data transfer is accurate and complete
3	**Verify machine/system/ process operation**	3.1	Undertake appropriate checks after downloading to ensure machine operation or process output is accurate to specification
		3.2	Ensure specific problems in machine operation or process output being controlled by the programmable controller are identified in accordance with SOPs
		3.3	Ensure specific changes required to operating parameters within the software program are derived in accordance with manufacturers' specifications and procedures
		3.4	Make adjustments/changes to operating parameters in accordance with manufacturers' specifications
		3.5	Take final check of machine operation and/or process output to ensure that they are in accordance with specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.6 Report changes and adjustments in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Verify includes the following:	• verification of machine/process/system operation, including interpreting the program, excluding multi-loop and control sequencing programs

Operating parameters include one (1) or more of the following:	• timer settings
	• counter settings
	• set point settings
	• specifications and procedures gained from:
	  • a range of circuit drawings
	  • engineering data sheets
	  • step print out
	  • manufacturers' procedure
	  • data books

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10004B Enter and change programmable controller operational parameters

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Assessment Requirements for MEM10004 Enter and change programmable controller operational parameters

Modification History

Release 1. Supersedes and is equivalent to MEM10004B Enter and change programmable controller operational parameters

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for downloading software programs for a programmable logic controller (PLC) and/or distributed control system (DCS), and undertaking appropriate checks ensuring data transfer is accurate and completed according to specifications
- verifying system operation and making adjustments to the operating parameters, as required
- completing final check of machine operation and/or processing for compliance to specifications
- reporting all changes and adjustments according to standard operating procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- appropriate and correct program loading techniques and reasons for selecting the chosen program loading technique
- checks to be undertaken during and after downloading
- reasons for checking that the data transfer is accurate and complete
- action to be taken if data transfer is inaccurate and/or incomplete
- specifications relating to the transferred data
- correct operation of the machine or process
- specific machine operations or process outputs being controlled by the programmable controller
- specific problems in accordance with SOPs
- operating parameters within the software program

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- SOPs, including industry standards, production schedules, safety data sheets (SDS), work notes and plans, product labels, manufacturers' specifications, operator manuals, enterprise policies and procedures, supervisors' oral and written instructions, current state/territory work health and safety (WHS) legislation, standards and codes of practice
- specification to be met and functions to be controlled and machine operation or process output
- reporting process
- procedures to change parameters and their implications.

Assessment Conditions

- Assessors must:
  - have vocational competency in entering and changing programmable controller operational parameters at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10005 Commission programmable controller programs

Modification History

Release 1. Supersedes and is equivalent to MEM10005B Commission programmable controller programs

Application

This unit of competency defines the skills and knowledge required to adjust and commission the programmable controller program to specification. It applies to all programmable controller programs include single and multi-loop programs and control sequencing of processes.

Work is undertaken on location and it is assumed that this unit will normally be accessed in conjunction with units of skill that relate to the operational processes controlled by the programmable controllers, including programmable logic controller (PLC) and distributed control system (DCS) or similar devices.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10004	Enter and change programmable controller operational parameters
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Installation and commissioning

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Commission programmable controller program**	2.1	Determine and understand program format and operational intent
		2.2	Check program instructions for compliance with specifications using appropriate techniques
		2.3	Set software timers and counters to specifications, where required
		2.4	Ensure program is stepped through manually and outputs are checked and measured for compliance with specifications
		2.5	Edit program to meet specifications, where applicable
		2.6	Check external inputs for compliance with specifications utilising correct and appropriate techniques
		2.7	Run program and check total operation for compliance with specifications, where applicable
		2.8	Undertake final adjustments to meet operational specifications using procedures, where applicable

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Specifications include one (1) or more of the following:

- circuit drawings
- ladder diagrams
- engineering data sheets
- program print-out manufacturers' procedures
- data books

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10005B Commission programmable controller programs

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10005 Commission programmable controller programs

Modification History

Release 1. Supersedes and is equivalent to MEM10005B Commission programmable controller programs

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications for commissioning programmable controller programs for compliance using appropriate checks
- commissioning single and multi-loop programs and control sequencing of processes for compliance with specifications using appropriate techniques
- editing program and making final adjustments to meet operational specification, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- format and specifications of the program
- procedures for checking that program instructions comply with specifications and procedures for dealing with any non-conformances with specifications and techniques used
- procedures for manually stepping through the program
- function of software timers and counters and procedures for setting them
- techniques and checks to be used in checking program outputs
- measurements to be taken during the checking of program outputs
- instruments to be used to take measurements
- checks to be made to ensure that the external inputs comply with specifications
- techniques and equipment to be used in checking external inputs
- specifications and operational processes controlled by the programmable logic controller
- techniques and equipment to be used to check the operational process
- procedures for running and editing programs
- procedures to be followed when adjusting programs

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- adjustments that can be made to the program
- effects of adjustments on the operational processes controlled by the program.

Assessment Conditions

- Assessors must:
  - have vocational competency in commissioning programmable controller programs at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10006 Install machine/plant

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10006 Install machine/plant (Release 1).

Release 1. Supersedes and is equivalent to MEM10006B Install machine/plant.

Application

This unit of competency defines the skills and knowledge required to install machine/plant where the equipment being installed requires substantial modification to the existing site and/or connecting equipment and excludes minor modifications.

Work is undertaken utilising new or existing external and internal locations and sites and foundations, footings, beds and frameworks are completed prior to installation and commissioning.

Installation covered by this unit also excludes electrical installation.

Where design skills are required see unit MEM09011 Apply basic engineering design concepts.

Where existing machines/plant are replaced by the same or similar machine/plant see unit MEM18006 Perform precision fitting of engineering components.

Where balancing skills or manufacture of gaskets is required see appropriate units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18009	Perform precision levelling and alignment of machines and engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Inspect and prepare installation site**	2.1	Check site for correct location, dimension and levels utilising appropriate measuring equipment
		2.2	Report non-compliance with specification to appropriate authority
		2.3	Undertake alteration/correction with approval of appropriate authority
		2.4	Prepare all surfaces, materials and components for use
3	**Install machine/plant**	3.1	Ensure all work is carried out safely and in accordance with site procedures and to Australian Standards
		3.2	Prepare machine components for correct sequential installation
		3.3	Install machine/plant in accordance with manufacturers' and site specifications
		3.4	Undertake routine modifications/alterations according to procedures, where required
		3.5	Ensure machine/plant is levelled, aligned, coupled and connected (excluding electrical connections) in accordance with specifications
		3.6	Clean site and clear all debris and leave in safe state
		3.7	Ensure all reports and documentation is completed to required specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Machine/plant includes one (1) or more of the following:	• pumps • blowers • compressors • drive units • production equipment and plant • process equipment • plant and machinery • engineering plant • machine tools
Routine modifications/alterations include one (1) or more of the following:	• fitting of spacers • relocation of brackets • alignment of holes

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM10006 Install machine/plant (Release 1).

Release 1. Supersedes and is equivalent to MEM10006B Install machine/plant.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10006 Install machine/plant

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10006 Install machine/plant (Release 1).

Release 1. Supersedes and is equivalent to MEM10006B Install machine/plant.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for installing machine/plant and confirming site is level utilising appropriate measuring equipment and all surfaces, materials and components are prepared in accordance with manufacturers' and site specifications
- installing machine/plant in accordance with specifications
- levelling, aligning, coupling and connecting machine/plant in accordance with specifications
- undertaking routine modifications/alterations in accordance with procedures, as required
- completing all reports and documentation to required specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- installation specification of the machine/plant
- procedures to follow if the location, dimensions and/or levels of the site do not comply with the specifications
- procedures for checking whether the installed machine/plant conforms to specifications
- materials and components to be used in the installation of the machine/plant
- applicable codes and standards
- installation sequence
- methods to locate, fix/fasten machine/plant
- methods of lifting/moving machine/plant and components
- techniques, tools and equipment to measure site and machine/plant installation.

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Assessment Conditions

- Assessors must:
  - have vocational competency in installing machine and plant at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10007 Modify control systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10007 Modify control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM10007C Modify control systems.

Application

This unit of competency defines the skills and knowledge required to plan the commissioning procedure, assess the control system performance, adjust the control system and undertake commissioning modifications.

Some jurisdictions may require the holder of this unit using the refrigeration and air conditioning pathways to be licensed or certified and users should check with the relevant authorities.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

Path 1	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12003	Perform precision mechanical measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM12025	Use graphical techniques and perform simple statistical computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information

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	MEM16010	Write reports
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18003	Use tools for precision work
	MEM18006	Perform precision fitting of engineering components
	MEM18018	Maintain pneumatic system components
	MEM18019	Maintain pneumatic systems
	MEM18020	Maintain hydraulic system components
	MEM18021	Maintain hydraulic systems
	MEM18022	Maintain fluid power controls
	MEM18023	Modify fluid power system operation
	MEM18053	Modify fluid power control systems
	MEM18055	Dismantle, replace and assemble engineering components
Path 2	MEM05001	Perform manual soldering/desoldering - electrical/electronic components
	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12004	Perform precision electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools

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	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18057	Maintain/service analog/digital electronic equipment
	MEM18060	Maintain, repair control instrumentation - single and multiple loop control systems
	MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
	MEM18067	Tune control loops - multi controller or multi element systems
Path 3	MEM05001	Perform manual soldering/desoldering - electrical/electronic components
	MEM05002	Perform high reliability soldering and desoldering
	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12004	Perform precision electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18056	Diagnose and repair analog equipment and components
	MEM18057	Maintain/service analog/digital electronic equipment

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	MEM18058	Modify electronic equipment
	MEM18059	Modify electronic systems
	MEM18065	Diagnose and repair digital equipment and components
Path 4	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18086	Test, recover, evacuate and charge refrigeration systems
	MEM18088	Maintain and repair commercial air conditioning systems and components
	MEM18092	Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls
Path 5	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations

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	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18086	Test, recover, evacuate and charge refrigeration systems
	MEM18090	Maintain and repair industrial refrigeration systems and components
	MEM18092	Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls
Path 6	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18086	Test, recover, evacuate and charge refrigeration systems
	MEM18089	Maintain and repair central air handling systems

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	MEM18090	Maintain and repair industrial refrigeration systems and components
	MEM18093	Maintain and repair integrated industrial refrigeration and/or large air handling system controls
Path 7	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18060	Maintain, repair control instrumentation - single and multiple loop control systems
	MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
	MEM18064	Maintain instrumentation system components
	MEM18067	Tune control loops - multi controller or multi element systems

Competency Field

Installation and commissioning

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan commissioning procedure**	2.1	Determine control system format and understand operational intent
		2.2	Sequence commissioning procedures effectively to meet requirement of components and control application
3	**Check control system installation**	3.1	Verify correct installation of system components against specifications
		3.2	Ensure appropriate test equipment is functional and calibrated before use
		3.3	Ensure components or control loop/system is powered up and checked for correct supply in accordance with specifications
		3.4	Ensure all readings/measurements are obtained, interpreted and recorded
4	**Adjust control system and assess performance**	4.1	Adjust control loop/system components to meet control characteristics, application and process specifications utilising appropriate techniques
		4.2	Make final verifications including any operational adjustments to ensure required performance

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Commission modifications**	5.1 Ensure necessary modifications to change performance in order to meet manufacturers' or operational specifications or safety and legislative requirements are undertaken or actioned
	5.2 Provide reports on system/process characteristics for warranty, handover and legislative purposes
	5.3 Document all modifications and record result according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Commissioning includes:	• the development of a commissioning procedure, testing of operation and adjustment to conform to specification
Control system includes:	• closed or open on continuous or step process control systems. Loop/system control can incorporate the use of pneumatics, electrical, electronics, hydraulics or a combination

System components include one (1) or more of the following:	• all instruments and devices which make up or control a loop/system, including:
	  • sensing devices
	  • control devices

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- actuators
- transducers

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM10007 Modify control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM10007C Modify control systems.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10007 Modify control systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10007 Modify control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM10007C Modify control systems.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for determining control system to meet specifications and control application
- planning commissioning procedure involving the development of a commissioning procedure, testing of operation and adjustment to conform to specification
- verifying control system components, including all instruments and devices which make up or control a loop/system against specifications
- using appropriate test equipment to check control system installation in accordance with specifications in a safe and effective manner
- adjusting control loop/system components and making final verifications to ensure required performance of control application
- making modifications to change performance to meet specifications and safety and legislative requirements
- providing reports where required and documenting all modifications in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- control system format
- operational intent of the processes being controlled by the control system
- specifications of the control system and the processes being controlled
- regulatory and legislative requirements associated with the commissioning procedure
- procedures for commissioning the control system
- procedures for ensuring that control characteristics, application and process specifications are achieved
- components of the operational processes

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- installation specifications for each component of the operational processes
- measuring techniques and equipment appropriate to the measurements to be taken
- test equipment and techniques appropriate to the commissioning of the control
- calibration procedures for the selected test equipment
- procedures for energising components and/or the control loop/system
- supply requirements of components and the control loop/system
- recording requirements for readings/measurements taken
- adjustments that can be made to the control loop/system components and effects of adjustments on the control characteristics and operational processes
- measurements/tests to be undertaken to verify control system and process operation and reasons for selecting the chosen measurements/tests
- procedures to be followed if the operational specifications of the control system and/or process cannot be achieved
- effect of changes to control system components on system performance
- appropriate authority to approve any modifications
- reporting requirements associated with the commissioning of control systems
- requirements and reasons for recording modifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying control systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10008 Undertake commissioning procedures for plant and/or equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10008 Undertake commissioning procedures for plant and/or equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM10008B Undertake commissioning procedures for plant and/or equipment.

Application

This unit of competency defines the skills and knowledge required to undertake commissioning work on internally or externally located plant and/or equipment that is new, or replaced, or has been extensively modified (by people usually outside of the commissioning individual or team).

Where reports are required to be completed see unit MEM16010 Write reports.

Where additional specialist applications are required in undertaking commissioning procedures e.g. fluid power, instrumentation and programmable logic controller (PLC), see appropriate units.

This unit is not intended to be used by maintenance personnel completing their own work, including return to service work, as these activities are covered in the following units:

- MEM09011 Apply basic engineering design concepts
- MEM18004 Maintain and overhaul mechanical equipment
- MEM18006 Perform precision fitting of engineering components
- MEM18054 Fault find, test and calibrate instrumentation systems and equipment

Some jurisdictions may require the holder of this unit using the refrigeration and air conditioning pathways to be licensed or certified and users should check with the relevant authorities.

Band: **B**

Unit Weight: **4**

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Pre-requisite Unit

Path 1	MEM09002	Interpret technical drawing
	MEM10006	Install machine/plant
	MEM11011	Undertake manual handling
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18003	Use tools for precision work
	MEM18006	Perform precision fitting of engineering components
	MEM18009	Perform precision levelling and alignment of machines and engineering components
	MEM18055	Dismantle, replace and assemble engineering components

Path 2	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information

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	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18086	Test, recover, evacuate and charge refrigeration systems
	MEM18090	Maintain and repair industrial refrigeration systems and components
Path 3	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM12024	Perform computations
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM14006	Plan work activities
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18089	Maintain and repair central air handling systems

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan commissioning procedure**	2.1	Determine control system format and understand operational intent
		2.2	Sequence commissioning procedures effectively to meet requirement of components and control application
3	**Assess system performance**	3.1	Use correct measuring/test devices
		3.2	Take all necessary measurements/readings at appropriate points
		3.3	Record all variances from specifications in accordance with procedures
4	**Adjust plant**	4.1	Adjust plant/system performance to design and operational specifications utilising appropriate and correct techniques
		4.2	Resolve technical difficulties in consultation with appropriate technical advisors
5	**Make reports**	5.1	Ensure report/logs are produced on completed system/plant/machinery/status/performance in accordance with procedures, as required

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Plant/system includes one (1) or more of the following:	• rotating equipment and machinery • production equipment • plant and machinery • process equipment • machine tools

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM10008 Undertake commissioning procedures for plant and/or equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM10008B Undertake commissioning procedures for plant and/or equipment.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10008 Undertake commissioning procedures for plant and/or equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM10008 Undertake commissioning procedures for plant and/or equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM10008B Undertake commissioning procedures for plant and/or equipment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for undertaking commissioning procedures for plant and equipment that are new, or replaced or extensively modified
- planning the commissioning procedure in consultation with appropriate personnel and ensuring approvals are obtained in accordance with procedures
- assessing system performance by taking necessary measurements and readings using appropriate test equipment in a safe and effective manner and recording all variances from specifications
- adjusting plant/system performance to specifications and resolving technical difficulties with appropriate personnel
- providing reports in accordance with SOPs, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence of events in the commissioning of the machine/plant
- performance tests appropriate to the machine/plant to be commissioned
- measurements required to ensure conformance to specifications and correct points at which measurements are to be taken
- appropriate adjustments to bring the machine/plant into line with operational specifications based on engineering principles or appropriate technical advice
- reporting requirements relevant to the machine/plant being commissioned.

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Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking commissioning procedures for plant and or equipment at least to the level being assessed with relevant industry knowledge and experience.
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10009 Install refrigeration and air conditioning plant and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM10009B Install refrigeration and air conditioning plant and equipment

Application

This unit of competency defines the skills and knowledge required to install refrigeration/air conditioning systems in commercial, industrial, marine and transport applications in accordance with all relevant Commonwealth, state or territory legislation and regulatory requirements.

Work is undertaken using new or existing internal or external locations and sites and footings, foundations, beds and frameworks are completed prior to installation.

This unit should not be selected with unit MEM10006 Install machine/plant.

Where extensive fitting and alignment are required then see the following units:

- MEM18006 Perform precision fitting of engineering components
- MEM18009 Perform precision levelling and alignment of machines and engineering components

Where modifications involve electrical disconnection and reconnection see unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM09002	Interpret technical drawing

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MEM10010	Install pipework and pipework assemblies
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and prepare installation site**	2.1	Check site for correct location, dimension and levels using appropriate measuring equipment and standard refrigeration/air conditioning practices
		2.2	Report non-compliance with specification to appropriate authority

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.3	Undertake alteration/correction with approval of appropriate authority
		2.4	Prepare all surfaces, materials and components for use
3	**Install refrigeration/air conditioning plant and equipment**	3.1	Carry out all work safely and in accordance with site procedures and to relevant standards
		3.2	Organise refrigeration/air conditioning plant and equipment/components for correct sequential installation
		3.3	Install refrigeration/air conditioning plant and equipment/components in conformance with manufacturers' and site specifications
		3.4	Undertake routine modifications/alterations of the refrigeration/air conditioning plant and equipment according to procedures, as required
		3.5	Ensure refrigeration/air conditioning plant and equipment are levelled, aligned, coupled and connected in accordance with specifications
		3.6	Ensure the refrigeration system is charged with refrigerant and lubricant in accordance with procedures
		3.7	Clean the site and clear all debris and leave in a safe state
4	**Start up refrigeration/ air conditioning plant and equipment and check operation**	4.1	Develop start-up procedure for the refrigeration/air conditioning plant and equipment
		4.2	Ensure the refrigeration/air conditioning plant and equipment are operated and assessed for conformance to specification
		4.3	Identify non-conformances and system faults and take appropriate action/adjustments to specification
		4.4	Complete all reports and documentation to required specifications

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Measuring equipment includes one (1) or more of the following:	• lasers • dumpy levels
Relevant standards include one (1) or more of the following:	• Australian Standards • building codes • air conditioning/refrigeration standards • local authority standards • environmental standards • greenhouse emission regulations
Refrigeration/air conditioning plant and equipment/components include one or more of the following:	• compressors • evaporators • condensers • valves • controllers • fans • solenoids • sensors • thermostats • switches • recorders
Routine modifications/alterations include one (1) or more of the following:	• fitting of spacers • relocation of brackets • alignment of holes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate action includes the following:	• in accordance with urgency requirements to address equipment failure and/or personnel danger

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10009B Install refrigeration and air conditioning plant and equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10009 Install refrigeration and air conditioning plant and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM10009B Install refrigeration and air conditioning plant and equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, regulatory and legislative requirements for installing refrigeration and air conditioning plant and equipment
- preparing the installation site and ensuring all surfaces are level using appropriate measuring equipment
- installing refrigeration/air conditioning plant and equipment and components to relevant standards
- charging the refrigeration system with refrigerant and lubricant in accordance with procedures
- developing a start-up procedure for installed refrigeration/air conditioning plant checking for conformance with specifications
- identifying any system faults and non-conformance and taking appropriate remedial action in accordance with urgency requirements to address equipment failure and/or personnel danger
- completing all reports and documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for non-compliances
- procedures for checking the refrigeration/air conditioning plant and associated equipment
- procedures for making alterations, corrections or adjustments to the refrigeration/air conditioning plant and associated equipment
- correct sequential installation of all components
- procedures for checking refrigeration systems for leaks
- methods of fixing/fastening and locating/holding the components

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- procedures for checking refrigeration/air conditioning plant and associated equipment prior to start-up
- procedures for adjusting the refrigeration/air conditioning plant and associated equipment to specification
- codes and regulations relevant to the refrigeration/air conditioning industry, including environmental, ozone and greenhouse substance legislation.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing refrigeration and air conditioning plant and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10010 Install pipework and pipework assemblies

Modification History

Release 1. Supersedes and is equivalent to MEM10010B Install pipework and pipework assemblies

Application

This unit of competency defines the skills and knowledge required to plan, prepare and install pipework and assemblies.

Where pipework is to be cut by mechanical or thermal methods, or where welding processes are used, the appropriate unit(s) should also be selected.

Where the pipework is to be formed and shaped using mechanical and/or thermal techniques then unit MEM05010 Apply fabrication, forming and shaping techniques should also be selected.

Where pipework and assemblies are to be part of a system/process covered by legislative/regulatory requirements, units associated with the appropriate welding certificates for the pipe material and particular application must also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan the installation of pipework and pipework assemblies**	2.1	Ensure quantity and type of pipework and pipework assemblies are selected according to specifications
		2.2	Determine the appropriate sequence for the installation of pipework and pipework assemblies according to the installation type and specifications and other applicable factors
		2.3	Prepare the work area for installation of pipework and pipework assemblies
3	**Prepare pipework and pipework assemblies for assembly**	3.1	Clean pipework according to SOPs
		3.2	Ensure all pipework and assemblies are purged according to SOPs
		3.3	Ensure pipework and assemblies are capped/sealed

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Install pipework and assemblies**	4.1 Install enclosures/hangers/support systems without damage or distortion to the surrounding environment or other services
	4.2 Install pipework and assemblies without damage or distortion to pipework, assemblies or surrounding environment or other services
	4.3 Leak test pipework in accordance with SOPs
	4.4 Install all ancillary devices and materials to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Pipework and pipework assemblies of a variety of sizes and/or wall thickness include one (1) or more of the following:	• ferrous • non-ferrous • plastic
Joining systems include one (1) or more of the following:	• collars • unions • flanges
Enclosures include the following:	• metal and PVC

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hangers and support systems include one (1) or more of the following:	• pipe/tube bundle support • ties • unistrut • trays • ladder racks • ducts
Leak tests include one (1) or more of the following:	• soapy water • water immersion • compressed air
Ancillary devices and materials include one (1) or more of the following:	• insulation materials • valve control systems
Legislation and regulations include the following:	• building regulations and gas/fluid pipeline regulations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10010B Install pipework and pipework assemblies

Links

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Assessment Requirements for MEM10010 Install pipework and pipework assemblies

Modification History

Release 1. Supersedes and is equivalent to MEM10010B Install pipework and pipework assemblies

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, legislative and regulatory requirements for installing pipework and pipework assemblies
- preparing installation of pipework and pipework assemblies by determining sequence of installation
- ensuring all pipework are cleaned, purged and capped/sealed
- installing pipework and pipework assemblies using hangers and support systems without damage or distortion to the surrounding environment or other services
- leak testing pipework to specifications
- installing all ancillary devices and materials to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- installation techniques
- site and safety requirements
- cleaning procedures and the applications and precautions for using solvents/cleaning material
- purging techniques, applications and precautions
- capping/sealing pipework and assembly methods
- identification of location/layout of pipework and assemblies and application and characteristics of enclosure/hanging/supporting systems
- pipework, ancillary installation and joining procedures
- leak testing applications and uses
- regulations and legislative requirements, including building regulations and gas/fluid pipeline regulations.

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Assessment Conditions

- Assessors must:
  - have vocational competency in installing pipework and pipework assemblies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10011 Terminate and connect specialist cables

Modification History

Release 1. Supersedes and is equivalent to MEM10011B Terminate and connect specialist cables

Application

This unit of competency defines the skills and knowledge required to prepare for the termination and connection of specialist cables that require particular techniques and, in some cases, testing.

Most types of these cables are designed to either exclude or minimise the ingress of gas or liquids, or to minimise the danger of flash.

Special fittings must be used for each type of specialist cable and cables requiring the use of bending tools and techniques which do not cause damage.

All testing is undertaken on completed circuits where these are not connected to main supply, using appropriate methods, including continuity and resistance checks.

Where termination and connection of standard electrical wiring/cable is required see unit MEM10002 Terminate and connect electrical wiring.

Where the selection and use of engineering measurement is required see unit MEM12023 Perform engineering measurements.

Where the selection and use of power tools/hand held operations is required see unit MEM18002 Use power tools/hand held operations.

Where termination and connection of signal and data cables is required see unit MEM18063 Terminate signal and data cables.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

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Unit Weight: **3**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for termination and connection of specialist cables**	2.1	Ensure all work is undertaken safely to workplace procedures, applicable regulations and legislative requirements
		2.2	Select correct cables and materials in accordance with

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		job requirements
	2.3	Obtain certification documentation, as appropriate
	2.4	Ensure preparation of work is undertaken or checked/inspected for correct locations and specifications
3 **Connect specialist cables**	3.1	Ensure terminations/connections are made to specifications, manufacturers' requirements and to safety and state/territory regulations and legislative requirements
	3.2	Ensure all entry points are sealed using appropriate compounds, including resins
	3.3	Install equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design
	3.4	Test all cabling, connections and terminations for compliance with specifications
	3.5	Ensure all cables, wires, conductors and connections are marked/tagged and labelled to specifications
	3.6	Complete documentation in accordance with relevant specifications and regulatory requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Specialist cables include one (1) or more of the following:	• mineral insulate cables (MIMS) • steel wire armoured cables (SWA) • other sheathed cables, including piloted cables • composite screened cables • braided cables • cable installations requiring specialised glands, fittings and enclosures
Tested includes the following:	• testing of both continuity and insulation resistance to requirements

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10011B Terminate and connect specialist cables

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10011 Terminate and connect specialist cables

Modification History

Release 1. Supersedes and is equivalent to MEM10011B Terminate and connect specialist cables

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings, regulatory and legislative requirements for terminating and connecting specialist cables
- connecting and terminating specialist cables utilising a range of cable installations requiring specialised glands, fittings and enclosures, sealing entry points, as required, and marking/tagging and labelling wiring to specifications
- using test equipment to locate various faults
- inspecting and testing terminated cables to ensure they comply with continuity and insulation resistance and are safely intended for use
- completing all reports and documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- worksite procedures and relevant statutory requirements
- statutory requirements associated with the termination and connection of specialist cables
- manufacturer requirements and specifications for specialist cables and materials
- requirements for approval to work
- wiring support and/or protection requirements
- specifications of wiring support and/or protection requirements
- reading and interpreting relevant drawings, instructions and reference documents
- testing methods for specialist cables, including continuity and insulation resistance testing
- marking, tagging and labelling requirements for cables, wires, conductors and connections
- data to be recorded and/or reported and the frequency of recording/reporting
- impact of the site and location variables may have on termination and connection.

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Assessment Conditions

- Assessors must:
  - have vocational competency in terminating and connecting specialist cables at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10013 Install split air conditioning systems and associated pipework

Modification History

Release 1. Supersedes and is equivalent to MEM10013A Install split air conditioning systems and associated pipework

Application

This unit of competency defines the skills and knowledge required to install split air conditioning systems and associated pipework up to 18 kW cooling capacity.

This unit refers to plug in applications only. Where the installation and connection to mains supply of fixed wiring is necessary then this work must be undertaken by a suitably licensed person.

Where commissioning and decommissioning of split air conditioning systems is required see unit MEM18084 Commission and decommission split air conditioning systems.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate split air conditioning components**	2.1	Determine the location of unit components, piping and drains in consultation with customer and other site considerations
		2.2	Ensure industry and local authority requirements, standards and codes and manufacturer requirements are identified, including the appropriate capacity rating of the equipment and any impacts on the installation are identified
3	**Inspect and prepare installation sites**	3.1	Carry out all work safely to Australian Standards, state and local codes and regulations
		3.2	Prepare the installation site to industry codes of practice and manufacturer installation instructions, as appropriate
		3.3	Carry out the work without damage to the system, components and the surrounding environment or services

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Prepare split system equipment and materials for installation**	4.1	Identify and note safety hazards and ensure established risk control measures are implemented
		4.2	Consult appropriate personnel to ensure the work is coordinated effectively with others involved on the worksite
		4.3	Check all components, piping and fittings for conformance to manufacturer specification, job requirements and applicable standards
		4.4	Determine the layout of the pipework from job specifications and diagrams
		4.5	Obtain materials needed to carry out the work in accordance with established procedures and check against job requirements
		4.6	Obtain tools, equipment and testing devices needed to conduct the work in accordance with established procedures and check for correct operation and safety
		4.7	Check preparatory work to ensure no damage has occurred and that it complies with work requirements
5	**Prepare and install refrigerant pipework**	5.1	Use tools and equipment in accordance with manufacturers' instructions
		5.2	Ensure pipework is prepared and joined to required specification with minimal wastage and damage/contamination to environment
		5.3	Join pipework and fittings using appropriate pipe joining methods
		5.4	Ensure pipes are run separately and insulated according to manufacturer instructions and to relevant standards codes and regulations
		5.5	Check pipework and joins for compliance and integrity using appropriate testing methods

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unit components include the following:	• outdoor unit, indoor unit, fittings and fixtures
Site considerations include the following:	• inside wall, drains, pipe runs, exposure, access, air circulation, environment and power supply
Prepare installation site includes one (1) or more of the following:	• clearing and levelling • foundations • wall fixtures • roof mounting
Prepared and joined includes the following:	• cutting to length, flaring, swaging and bending
Pipe joining methods include one (1) or more of the following:	• silver brazing • soldering
Equipment and testing devices include one (1) or more of the following:	• refrigeration gauge manifold • Schraeder access valves • quick connect couplings • thermometer/thermocouple temperature measuring devices • analogue and digital vacuum measuring gauges • digital scales • refrigerant recovery unit • vacuum pump • electronic leak detectors • refrigerant containers/cylinders

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Industry best practice includes the following:	• pipe preparation and joining techniques and industry best practice for pipe brazing
Commonwealth, state and territory legislation, regulations, standards, codes of practice, and industry guidelines include the following:	• The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 • air conditioning residential best practice guidelines (AIRAH) • state/territory and local building regulations • codes of practice for domestic refrigeration and air conditioning (HB40)
Appropriate testing methods include the following:	• dimensional checks and leak tests

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM10013A Install split air conditioning systems and associated pipework

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10013 Install split air conditioning systems and associated pipework

Modification History

Release 1. Supersedes and is equivalent to MEM10013A Install split air conditioning systems and associated pipework

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, customer requirements, regulatory and legislative requirements for installing plug in split air conditioning systems and associated pipework up to 18 kW cooling capacity
- preparing the installation site for installing unit components to manufacturer requirements, standards, codes and regulations
- using tools and equipment to prepare and join pipework to specifications
- ensuring pipes are run separately and insulated to specifications and relevant standards, codes and regulations
- checking the installed system for compliance and integrity using appropriate testing methods and test equipment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- basic vapour compression cycle operating principles
- basic reverse cycle operating principles
- layouts, siting and set-ups of split air conditioning systems
- typical work environment, demands and considerations
- effective communication with appropriate persons and typical problems, contingencies and solutions
- components, accessories and fixtures for split air conditioning systems
- considerations for siting units and components and techniques and processes for site preparation
- fixing methods, tools and equipment for system components and pipework
- applicable legislative requirements, standards, codes and licensing requirements for installing system components, interconnecting wiring and connection to power supply

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- applicable procedures for storage, handling and treatment of ozone depleting and synthetic greenhouse gas refrigerant
- sustainable energy practices for the efficient use of materials and for minimising damage/contamination to environment
- tools and equipment used for fabricating pipework
- pipe preparation and joining techniques including cutting, flaring, swaging and bending
- brazing/silver soldering techniques, equipment and consumables
- dry nitrogen being used during all brazing/silver soldering work
- procedures and equipment for checking pipework integrity and compliance to specification
- procedures for reporting non-conformances
- required documentation and procedures to complete and process.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing split air conditioning systems and associated pipework at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10016 Terminate and test electrical wiring and accessories

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training, and the recognition of trade-level skills in the termination and testing of electrical cables, cords and accessories using appropriate fixing devices and methods.

It covers the installation requirements for a wide range of typically used electrical cables in a variety of situations and separation from other services, including fire wall penetrations.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 32 – Describe the construction, specifications, colour coding and applications of various types of cords and cables.
- EPC 33 – Demonstrate the skills to prepare and terminate cords and cables.
- EPC 34 – Demonstrate the knowledge and skills for selection and attachment of electrical accessories, using appropriate fixing devices, tools and methods.

And

Essential Performance Capability (EPC) classified as ‘critical’:

- EPC 27 – Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring, including specialist cables.
- EPC 35 – Demonstrate the knowledge and skill to install and terminate a variety of electrical cables in a wide range of applications (including final subcircuits) to AS/NZS 3000.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

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Pre-requisite Unit

MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM18001	Use hand tools

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Prepare to terminate electrical cables and cords	2.1	Inspect accessories to determine the appropriate type and size of cable/cord and termination connectors/lugs, as required
		2.2	Obtain specialised tools, equipment and test instruments needed for terminating electrical cables and cords
3.	Terminate electrical cables and cords	3.1	Isolate and tag circuits and equipment in accordance with procedures, where required
		3.2	Prepare cable/cord end to suit connector/lug without causing any damage to insulation or conductor
		3.3	Fit and secure specialist cable glands and retaining

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		devices
	3.4	Ensure terminations/connections are made to specifications, manufacturer requirements, and regulatory and legislative requirements
	3.5	Ensure all entry points are sealed using appropriate compounds, including resins, where required
	3.6	Mark/tag and label all cables, wires, conductors and connections to specifications
4. Test electrical cables and cords	4.1	Test terminated cables to ensure continuity and insulation resistance readings comply with requirements
	4.2	Complete all reports and documentation to the required specifications and SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical cable and cord types include five (%) or more of the following:

- thermoplastic insulated cable (TPI)
- flat thermoplastic sheathed (TPS)
- circular thermoplastic sheathed (TPS)
- steel wired armoured (SWA)
- fire rated cable (high tension (HT) or high frequency (HF) or mineral insulated metal sheath (MIMS))
- cross-linked polyethylene (XLPE) cables
- neutral screened cables
- flexible cords and cables

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	• aluminium conductor/cable
Termination of cables and cords include two (2) or more of the following connectors and lugs:	connectors: • screw • stud • tunnel lugs: • crimp and compression • soldering • solderless
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) • AS/NZS 3008.1.1:2009 Electrical installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 3. Equivalent. Pre-requisites updated.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10016 Terminate and test electrical wiring and accessories

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- identifying the cables and cords by conductor size, type and rating
- preparing and terminating cable and cords to accessories using appropriate hardware, tools and equipment, including soldering without undue damage to insulation or conductor
- preparing and terminating at least five (5) or more of the following cable and cord types at a device terminal enclosure:
  - thermoplastic insulated cable (TPI)
  - flat thermoplastic sheathed (TPS)
  - circular thermoplastic sheathed (TPS)
  - steel wired armoured (SWA)
  - fire rated cable (high tension (HT) or high frequency (HF) or mineral insulated metal sheath (MIMS))
  - cross-linked polyethylene (XLPE) cables
  - neutral screened cables
  - flexible cords and cables
  - aluminium conductor/cable
- terminating the above selected cable and cord types into two (2) or more of the following connectors and lugs:
  - connectors:
    - screw
    - stud
    - tunnel
  - lugs:

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    - crimp and compression
    - soldering
    - solderless
- maintaining/achieving required fire rating
- inspecting and testing terminated cables to ensure they comply with continuity and insulation resistance requirements and are safely intended for use
- using test equipment to locate faults, completing remedial action and retesting to ensure compliance
- documenting termination and testing of electrical cables, cords and accessories in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- different types of electrical cables and cords and their applications
- structural components of cables and their purpose (conductor material, stranding, insulation type, voltage rating, screening, sheathing, armour and serving)
- Australian and International colour standards for cables and cords
- factors affecting cable current-carrying capacity:
    - current requirements for the circuit
    - cable installation method to be used
    - environmental conditions in the vicinity of cable installation
- Australian/New Zealand Wiring Rules requirements for flexible cords, cables and plugs
- Australian Standards and manufacture requirements for the termination of:
    - TPS and TPI cables
    - fire protection and MIMS cables
    - SWA
    - trailing cable and catenary wire systems
- soft soldering process, including the use of liquid petroleum (LP) gases and precautions to be observed
- fire rated cable types, including HT, HF and MIMS and their applications
- types of accessories and their intended use
- support, fixing and protection methods, including:
    - selection and safe application of devices for fixing to timber, metal, hollow structures, masonry and concrete
    - hazards and safety measures when working with adhesives and chemical fixing devices
- safe work methods for:
    - using hand and power tools
    - using powder and compressed gas operated tools

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- test requirements to ensure compliant continuity and insulation resistance and documentation to be completed.

Assessment Conditions

- Assessors must:
  - have vocational competency in terminating and testing electrical wiring and accessories at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10018 Select cable types and sizes to suit loads and electrical installation environment

Modification History

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training, and the recognition of trade-level skills in selecting cables for electrical installation work and equipment in areas including consumer mains, submains and final subcircuits for operating voltages up to 1000 V alternating current (AC) or 1500 V direct current (DC).

It covers a comprehensive understanding of the cable selection process of AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) and cable selection standards in determining maximum demand, voltage drop limitations, current carrying capacity and short circuit capability.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 21 – Demonstrate the ability to select cables for mains and submains using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capability, maximum demand and voltage drop, for single phase and three phase installations including multiple installations.
- EPC 22 – Demonstrate the ability to select cables for final subcircuits using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capability, maximum demand, earth loop impedance and voltage drop.
- EPC 27 – Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring. Including specialist cables.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

Nil

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Competency Field

Installation and commissioning

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job requirements	1.1. Follow standard operating procedures (SOPs)
	1.2. Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3. Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4. Identify job requirements from specifications, drawings, job sheets or work instructions
2. Select wiring systems and cables for electrical installation work and equipment	2.1. Select wiring systems to suit loads and electrical installation work environment
	2.2. Select cable conductor sizes based on current-carrying capacity, short circuit capacity, maximum demand, voltage drop and earth fault-loop impedance in accordance with regulatory requirements
	2.3. Select circuit protective devices based on current-carrying capacity requirements of the selected cables
	2.4. Select earthing system parts to meet the multiple earth neutral (MEN) system
	2.5. Document selection of cable types and sizes and installation requirements in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical installations include:

- at least one (1) general electrical installations comprising a main switchboard, supplying more than one circuit each for lighting, socket outlets and fixed appliances
- at least one (1) industrial electrical installation comprising a distribution board separate from the main switchboard and at least one (1) circuit supplying a three-phase load and safety system in one of the following industrial environments:
  - factory
  - building
  - off shore platform
  - mine site processing
  - oil and gas installation
  - processing plant
  - workshop
  - underground installation
- three-phase loads include at least one (1) or more of the following:
  - motors – for pumps, conveyors, mills, agitators, crushers and screening plants
  - heaters
  - compressor packages
  - heating, ventilation and air conditioning (HVAC) units
  - facility accommodation units, sea container workshops and storage units, and laboratories
  - workshop equipment, including lathes, milling machines and welders
  - underground dewatering systems and ‘gate end’ boxes for drilling equipment

Regulatory requirements

- AS/NZS 3000:2007 Electrical installations (known as the

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include:	Australian/New Zealand Wiring Rules) • AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10018 Select cable types and sizes to suit loads and electrical installation environment

Modification History

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- determining the cable routes, length and conditions in which the wiring system is to operate
- complying with relevant Australian/New Zealand Wiring Rules, Cable Selection and Service Rules when selecting cables ensuring coordination between protective devices and conductors in regard to the following aspects:
  - design of the circuit taking into account the safety considerations
  - determining the final subcircuit arrangements
  - determining the factors affecting suitability of wiring systems
  - calculating the maximum demand on consumer mains/submains
  - calculating the current-carrying capacity requirements
  - calculating the voltage drop requirements
  - calculating the expected fault loop impedance
  - selecting cables to satisfy voltage drop, current-carrying capacity and fault loop impedance requirements
  - selecting the appropriate protection devices
  - selecting the appropriate isolation devices and switching arrangements
- selecting earthing system parts to meet the multiple earthed neutral (MEN) system
- documenting reasons for selection and installation requirements in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- Australian/New Zealand Wiring Rules, AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions and other related standards in regards to the following:
  - design and safety performance requirements, including:
    - protection of persons, livestock and property from harmful effects
    - correct functioning of the electrical installation for intended use
    - compatibility with the electricity distribution system, or other source of supply, to which the electrical installation is to be connected
    - type of insulation required:
      - thermoplastic
      - elastomer
      - cross-linked polyethylene (XLPE)
      - mineral-insulated metal sheath (MIMS)
      - high temperature
    - supply characteristics
    - reasons for dividing installations into circuits and factors that determine their number and type
    - external influences that may damage installation and be considered in the design, including applying derating factors caused by the effect of:
      - grouping of cables
      - ambient temperature
      - depth of laying
      - thermal resistivity of soil
      - varying of loads
      - thermal insulation
      - direct sunlight
    - acceptable methods of protection against risks of ignition of flammable materials
    - likely sources of unwanted voltages and methods of dealing with this potential hazard
    - requirements for protection against fault current
    - protection against harmful effects of faults between live parts of circuits supplied at different voltages
    - mechanical movement protection
    - fire rated construction and how integrity of fire rating can be maintained
  - final subcircuit arrangements, including:
    - factors to consider when determining the number and type of circuits required
    - daily and seasonal demand for lighting, power, heating and other loads in a given installation
    - factors affecting current-carrying capacity of cables
    - layout/schedule of circuits

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  - factors affecting suitability of wiring systems
  - acceptable methods of determining maximum demand on an installation's consumer's mains and submains up to 400 A per phase
  - external factors that require the use of a derating factor when determining current-carrying capacity
  - requirements for maximum voltage drop in an installation and relevant tables for unit values of voltage drop
  - requirements for maximum fault loop impedance in an installation and the relevant tables to determine cable impedances
  - accepted methods used against indirect contact when selecting protection devices to protect against overload and short circuit current situations
  - provision of isolation of every circuit for a range of installations and conditions
  - earthing system parts including the selection of earth electrode, main earthing conductor, main earthing terminal/connection or bar, MEN link, protective earthing conductors and equipotential bonding
- effects of harmonic current on current-carrying capacity
- conditions where short circuit performance may need to be considered.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting cable types and sizes to suit loads and electrical installation environment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10019 Select circuit protection devices by type and rating, fit to switchboards and install earthing

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson –industrial electrician apprenticeship training and the recognition of trade-level skills in selecting and installing circuit protection devices to protect against electric shock, over current and over voltage for operating voltages up to 1000 V alternating current (AC) or 1500 V direct current (DC) and install earthing as per multiple earthed neutral (MEN) system.

It covers a comprehensive understanding of earthing arrangements, the MEN system (including sub-installations), the calculation and selection of protective devices, alternative arrangement against electric shock and the requirements for use of residual current devices (RCDs).

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 16 – Demonstrate and apply in practice the requirements of AS/NZS 3000 in relation to earthing arrangements and fault-loop impedance calculations. Knowledge of alternate earthing systems when required by local Regulatory Authorities.
- EPC 17 – Demonstrate a comprehensive knowledge and understanding of the MEN system and its application, including on sub-installations. Demonstrate how to test an MEN system.
- EPC 27 – Describe and apply in practice the requirements for circuit protection using AS/NZS 3000:2000 and other relevant Australian Standards, e.g. AS/NZS 3018.1.
- EPC 20 – Demonstrate knowledge of the SELV and PELV systems, their application and testing in accordance with AS/NZS 3000.
- EPC 23 – Describe and apply the control and protection requirements for installations and equipment. Demonstrate the ability to select suitable equipment and switchgear for a particular installation or part of an installation using AS/NZS 3000.
- EPC 24 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the location of switchboards and the arrangement of switchboard equipment in installations. Methods for determining prospective fault current. Switchboard form types.

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- EPC 26 – Demonstrate the appropriate methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation. Need for calibration of instruments.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM18001	Use hand tools

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1.	Determine job requirements	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job and load requirements from specifications, drawings, job sheets or work instructions
2.	Prepare and select circuit protection	2.1 Organise circuits and switchboard equipment to comply with layout drawings, specifications and regulatory

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	controls and devices for electrical installations		requirements
		2.2	Select suitable circuit protective devices to meet specifications
		2.3	Select RCDs to meet required circuit requirements and specifications
		2.4	Select switchgear/control gear by type, rating and purpose for a particular installation or part of an installation
3.	Install circuit protection controls and devices for electrical installations	3.1	Isolate and tag circuits and equipment in accordance with procedures, where required
		3.2	Install circuit protection devices in compliance with job specifications and requirements
		3.3	Install RCDs, where required, to protect all lighting and socket outlets in final subcircuits in domestic electrical installations
		3.4	Install switchgear (including main switch/s) and control gear according to manufacturer and regulatory requirements
		3.5	Check installed components are straight and square in the required locations and within acceptable tolerances
		3.6	Terminate earthing to meet with the MEN system requirements
		3.7	Inspect installed components and earthing system visually to ensure compliance
		3.8	Test the earthing system for continuity and insulation resistance to ensure compliance
		3.9	Mark all switches, circuit-breakers, RCDs and other electrical equipment on or adjacent to the switchboard
		3.10	Document selection of circuit protection devices and electrical installation arrangement in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Installations include:

- at least one (1) general electrical installation comprising a main switchboard, supplying more than one circuit each for lighting, socket outlets and fixed appliances
- at least one (1) industrial electrical installation comprising a distribution board separate from the main switchboard and at least one (1) circuit supplying a three-phase load and safety system in one of the following industrial environments:
  - factory
  - building
  - off shore platform
  - mine site processing
  - oil and gas installation
  - processing plant
  - workshop
  - underground installation
- three-phase loads include at least one (1) or more of the following:
  - motors – for pumps, conveyors, mills, agitators, crushers and screening plants
  - heaters
  - compressor packages
  - heating, ventilation and air conditioning (HVAC) units
  - facility accommodation units, sea container workshops and storage units, and laboratories
  - workshop equipment, including lathes, milling machines and welders
  - underground dewatering systems and ‘gate end’ boxes for drilling equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) • AS/NZS 3012:2010 Electrical installations – Construction and demolition sites
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10019 Select circuit protection devices by type and rating, fit to switchboards and install earthing

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- determining the individual load requirements of the installation
- selecting the appropriate switchboard and layout arrangements
- complying with Australian/New Zealand Wiring Rules, other Australian Standards, e.g. AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions, Service Rules and other relevant standards when selecting circuit protection controls and devices in regard to the following aspects:
  - protection against indirect contact, overcurrent or excess earth leakage current conditions and over and under voltage by selecting and installing using safe working practices:
    - a fuse/s for fault current limiting protection
    - an appropriate circuit breaker/s with a current rating not less than the maximum demand of the portion of the electrical installation they control
    - a residual current device (RCD) with a maximum rated residual current of 30 mA
  - control of the electrical installation (or parts thereof) by suitable switching arrangements by selecting and installing using safe working practices:
    - a main switch/es to control the whole of the electrical installation
    - switches for isolation, emergency, mechanical maintenance and functional (control) with appropriate Ingress Protection (IP) rating
  - installing and terminating the compliant earthing system components for the multiple earthed neutral (MEN) system and other earthing arrangements
  - terminating all circuit protection controls and devices

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    - inspect visually all components and earthing system to ensure compliance
    - test earthing system for continuity and insulation resistance
    - identify with marking all switches, circuit breakers and RCDs and other electrical equipment on or adjacent to the switchboard
- using test equipment to locate faults, completing remedial action and retesting to ensure compliance
- documenting reasons for selection and installation arrangement requirements in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Australian/New Zealand Wiring Rules and other related standards in regards to the following:
    - requirements for the selection and installation of switchgear and controlgear, including:
        - protection against indirect contact
        - protection against over current or excess earth leakage current conditions
        - protection against over voltage and under voltage
        - control of the electrical installation (or parts thereof) by suitable switching arrangements
        - design, selection (including form type) and installation of switchboards
    - design of an electrical installation
    - design, selection (including form type) and installation of switchboards
    - application and segregation requirements of separated extra-low voltage (SELV) and protected extra-low voltage (PELV) circuits, including earthing requirements and testing
    - application and arrangement of an isolated supply
    - hazards and risks in an electrical installation
    - protection against indirect contact, including:
        - methods of protection
        - protection by automatic disconnection of supply
        - touch-voltage limits
        - earthing system impedance
        - disconnection times
        - supplementary equipotential bonding
        - protection by the use of Class II equipment or by equivalent insulation
        - protection by electrical separation
    - protection by the use of RCDs
    - protection against thermal effects in normal service

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- protection against unwanted voltages
- protection against over current and fault currents
- protection against over voltage
- protection against injury from mechanical movement
- devices for isolation
- fire integrity
- protection from damp situations
- earthing system terms, parts and arrangement
- devices and operating principles for automatic disconnection of supply, including circuit breakers, fuse and RCDs
- devices for isolation and switching, including for the following functions:
  - isolation
  - emergency
  - mechanical maintenance
  - functional (control)
- switchboards and distribution boards purpose, types, application, layout and compliance requirements
- bonding of metallic meter enclosures
- minimum fault levels specified by electricity network operator
- methods for determining prospective fault current
- MEN arrangement, resultant fault current path and magnitude, operation of protective devices and implication of MEN link absence during fault conditions
- knowledge of alternate earthing systems when required by local Regulatory Authorities, e.g. TT low voltage supply earthing system in dairy sheds in New Zealand
- construction and demolition requirements as per AS/NZS 3012:2010 Electrical Installations – Construction and demolition sites.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting circuit protection devices by type and rating, fitting to switchboards and installing earthing at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace condition. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10020 Install low voltage cabling and fit-off accessories, appliances and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in installing low voltage cabling/wiring; fitting off accessories, appliances and equipment to an electrical switchboard in a variety of situations; and connecting consumer mains to an installation.

It covers a comprehensive understanding of AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) and regulatory requirements and knowledge of other standards that apply to particular situations and installations for selecting and fixing of accessories; the location of switchboards; arrangement and identification of switchboard equipment; and access requirements, including the separation and minimising the spread of fire.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 29 – Knowledge of the AS/NZS 3000 requirements for safety services and issues relevant to HV installations. Standards referenced for electrical installations related to transportable structures and vehicles, shows and carnivals, patient areas, marinas and boats, and construction/demolition sites.
- EPC 36 – Demonstrate the knowledge and skills for the installation of wiring support systems.
- EPC 39 – Determine and apply AS/NZS 3000 requirements for the installing, terminating and testing of catenary supported cables, pendant-type socket outlets and trailing cables.

And

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 24 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the location of switchboards and the arrangement of switchboard equipment in installations. Methods for determining prospective fault current. Switchboard form types.
- EPC 25 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the installation of electrical equipment in given damp situations and wet areas. IP rating of electrical equipment.

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- EPC 26 – Demonstrate the appropriate methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation. Need for calibration of instruments.
- EPC 27 – Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring. Including specialist cables.
- EPC 28 – Demonstrate knowledge of AS/NZS 3000 requirements for electrical installations in hazardous areas and an awareness of the standards to which it refers.
- EPC 35 – Demonstrate the knowledge and skill to install and terminate a variety of electrical cables in a wide range of applications (including final subcircuits) to AS/NZS 3000.
- EPC 37 – Demonstrate knowledge and skills to install final subcircuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and local supply authority requirements.
- EPC 38 – Connect consumer mains to an installation, in accordance with AS/NZS 3000 and local supply authority requirements.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection controls devices by type and rating, fit to switchboards and install earthing
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM10024	Install and troubleshoot luminaires and ancillary equipment
MEM18001	Use hand tools

Competency Field

Installation and commissioning

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Plan installation of electrical wiring, accessories and appliances	2.1	Plan cable routes in accordance with requirements contained in the job instructions/specifications
		2.2	Obtain necessary cables, appropriate cable support systems and enclosures, accessories and appliances needed for the installation work in accordance with established procedures and check against job requirements
		2.3	Obtain necessary tools, equipment and testing instruments needed for the installation work
3.	Install and fit off electrical wiring, accessories and appliances	3.1	Isolate and tag circuits and equipment in accordance with procedures, where required
		3.2	Install and fix cable support system in position ensuring components are square and plumb, securely attached using fastenings appropriate to the weight of the components and the material of the mounting
		3.3	Install electrical cables and wiring, accessories and appliances in compliance with specifications and regulatory requirements
		3.4	Maintain fire integrity when installing electrical cables and wiring
		3.5	Check installed accessories and appliances are straight and square in the required locations
		3.6	Terminate cables and conductors at switchboards,

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	accessories and appliances in accordance with manufacturer specifications and regulatory requirements
	3.7 Test and inspect installed circuits to ensure compliance in accordance with legislative and regulatory requirements
	3.8 Rectify any defects and re-test to ensure compliance
	3.9 Document installation of wiring, accessories and appliances in accordance with SOPs
4. Connect consumers mains to an installation	4.1 Install underground and overhead consumers mains
	4.2 Install unprotected consumers mains to reduce the risk of short circuit to a minimum
	4.3 Terminate consumers mains at pillars, pits, mains connection boxes and consumers switchboard
	4.4 Install bonding conductors, where required
	4.5 Ensure correct polarity

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical installations include:	• at least one (1) general electrical installation comprising a main switchboard, supplying more than one circuit each for lighting, socket outlets and fixed appliances • at least one (1) industrial electrical installation comprising a

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and safety system in one of the following industrial environments: • factory • building • off shore platform • mine site processing • oil and gas installation • processing plant • workshop • underground installation • three-phase loads include at least one (1) or more of the following: • motors – for pumps, conveyors, mills, agitators, crushers and screening plants • heaters • compressor packages • heating, ventilation and air conditioning (HVAC) units • facility accommodation units, sea container workshops and storage units, and laboratories • workshop equipment including lathes, milling machines and welders • underground dewatering systems and ‘gate end’ boxes for drilling equipment
Cable routes include one (1) or more of the following:	• internal to buildings • underground • aerial
Electrical cable and wiring types include five (5) or more of the following:	• thermoplastic insulated cable (TPI) • flat thermoplastic sheathed (TPS) • circular thermoplastic sheathed (TPS) • steel wired armoured (SWA) • fire rated cable (HT or HF or MIMS) • cross-linked polyethylene (XLPE) cables • neutral screened cables • flexible cables

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- aluminium conductor/cable
- underground cables
- aerial conductors

Termination of cables and cords include two (2) or more of the following connectors and lugs:

- connectors:
  - screw
  - stud
  - tunnel
- lugs:
  - crimp and compression
  - soldering
  - solderless

Cable support systems include four (4) or more of the following:

- metallic conduit
- non-metallic conduit
- trunking
- duct
- cable tray/ladder
- catenary
- posts/poles/struts

Regulatory requirements include:

- AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3018.1 Electrical installations – Domestic installations (or its equivalent updated version)
- local supply authority requirements

Safe working practices include:

- demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

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Links

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Assessment Requirements for MEM10020 Install low voltage cabling and fit-off accessories, appliances and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- planning the cable routes in accordance with legislative and customer requirements
- installing cable support systems
- complying with the following cable support system requirements:
  - bending steel conduits (where applicable) such that the internal diameter is not significantly reduced
  - preparing entry joints and joints to ensure cable insulation is not damaged
  - joining steel conduits together using appropriate accessories or if required through a welding process
  - ensuring that they are adequately sealed against entry of water or rain
- installing wiring systems using applicable cable support systems according to the electrical installation requirements and standards paying particular attention to factors effecting cable current-carrying capacity
- maintaining fire integrity
- terminating cables and conductors to switchboard protective devices
- terminating cables and conductors at switchboards, accessories and appliances according to legislative, regulatory and manufacturer requirements
- installing all accessories, appliances and equipment square and straight and in the required location using appropriate hand and power tools
- ensuring appropriate Ingress Protection (IP) rating when selecting suitable electrical equipment
- inspecting and testing installed and terminated cables to ensure they comply with continuity and insulation resistance and are safe to connect to the supply
- rectifying any defects and retesting to ensure compliance

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- connecting and terminating consumers mains to an installation
- completing appropriate documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Australian Standards, codes and requirements applicable to the installation for:
  - thermoplastic sheathed (TPS - flat and circular) and thermoplastic insulated (TPI) cables
  - fire protection and mineral insulated metal sheathed (MIMS) cables
  - steel wired armoured (SWA)
  - flexible cords used as fixed wiring
  - trailing cable and catenary wire systems
  - cables support systems
  - protection against mechanical damage
  - wiring systems likely to be disturbed
  - wiring systems installed vertically
  - change of direction
  - prohibited cable locations
  - selection and installation to minimise the spread of fire
  - limitation of circulating and eddy currents
- Australian/New Zealand Wiring Rules requirements for enclosure of cables, including:
  - types of wiring enclosures – change of wiring enclosures, entry of water and support of cables
  - installation of wiring enclosures – support, continuity, bending, passage of conductors, terminations, in direct sunlight, provision for expansion and cable trunking
  - factors effecting cable current-carrying capacity
- dissimilar metals in a corrosive environment
- application of protective coatings, e.g. paint, galvanizing and powder coatings
- techniques, tools and equipment required to install conduit (metallic and non-metallic), enclosures and support systems
- Australian Standards, codes and requirements applicable to the installation of electrical equipment, including:
  - appliances
  - switchgear, controlgear and accessories
  - switchboards – location and access, physical and circuit arrangements
  - socket outlets
  - lighting equipment and accessories, lamps and luminaires
  - smoke and fire detectors

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    - cooking appliances
    - appliances producing hot water or steam
    - room, space and duct heaters
    - electric heating cables for floors and ceilings
    - electricity converters
    - motors, transformers, capacitors and batteries
    - control, switching and over current and residual current device (RCD) protection
    - required and permitted locations for current-using equipment and accessories
    - suitable IP rating
- correct marking of equipment
- terminal configuration of phase, neutral and protective earthing conductors for each type of equipment
- installation standards called up by the Australian/New Zealand Wiring Rules for special situations, including:
    - movable premises and caravan parks
    - shows and carnivals
    - boating marinas
    - electromedical treatment areas
    - outdoor sites under heavy conditions
    - cranes and hoists
    - lifts
    - cold cathode illumination systems
    - electric fences
    - construction and demolition sites
    - film, video and television sites
    - telecommunications networks power supplies
    - hazardous areas e.g. AS/NZS 2430:2004 Classification of hazardous areas, AS/NZS 2381 Set:2008 Electrical equipment for explosive gas atmospheres – Selection, installation and maintenance Set (or their equivalent updated versions)
- Australian/New Zealand Wiring Rules requirements for special electrical installations or locations, including:
    - baths, showers or other fixed water containers
    - swimming pools, paddling pools and spa pools or tubs
    - sauna heaters
    - refrigeration rooms
    - locations where water general hosing down operations are carried out
    - fountains and water features
    - extra-low voltage electrical installations
    - high voltage electrical installations
    - hazardous areas
    - emergency systems

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- additional training required to work competently with electrical equipment for hazardous areas
- underground wiring systems, including:
  - arrangements and installation requirements
  - spacing from other underground services
  - consumer mains
- aerial wiring systems, including:
  - types of conductor
  - arrangements, clearances, distance between supports (spans), aerial conductor supports, poles and posts and joints and connections
  - Australian/New Zealand Wiring Rules and local supply authority requirements
  - testing of installed cables in compliance with Australian Standards
- cables supported by catenary, including:
  - types of cables
  - catenary supports
- tools, techniques and procedures for installing cables and wiring systems
- testing and verification of installed and terminated cables to ensure they comply with a visual inspection, all mandatory and optional tests and are safe to connect to the supply
- installation of underground and overhead consumer mains
- termination of consumer mains at pillars, pits, mains connection boxes and consumers switchboard
- installation of unprotected consumers mains to reduce the risk of short circuit to a minimum
- installation of bonding conductors, where required.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing low voltage cabling and fitting off accessories, appliances and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.

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- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM10021 Inspect, test and verify electrical installations

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in inspecting, testing and verifying electrical installations in accordance with the AS/NZS 3000:2007, Electrical Installations (known as the Australian/New Zealand Wiring Rules) and regulatory requirements.

It covers all aspects inspection and testing, including visual, application of mandatory testing, interpreting test results and recording reporting requirements.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 26 – Demonstrate the appropriate methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation. Need for calibration of instruments.
- EPC 30 – Demonstrate to AS/NZS 3000 and AS 3017 standards the electrical checks and tests required to ensure electrical installations are safe, reporting of test results typically required to satisfy regulatory requirements.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to

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	switchboards and install earthing
MEM10020	Install low voltage cabling and fit-off accessories, appliances and equipment
MEM10022	Commission and decommission high and low voltage equipment or installations
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM10024	Install and troubleshoot luminaires and ancillary equipment
MEM12023	Perform engineering measurements
MEM18001	Use hand tools
MEM18100	Fault-find, test and rectify AC machines and circuits
MEM18102	Fault-find, test and rectify single and three-phase transformers
MEM18103	Fault-find, test and rectify electrical circuits and equipment
MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job requirements	1.1 Follow standard operating procedures (SOPs)
	1.2 Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2.	Prepare to inspect, test and verify electrical installations	2.1	Review all relevant documentation pertaining to the electrical installation in preparedness for testing and verification
		2.2	Consult with relevant personnel in readiness for inspection, verification and testing of the electrical installation
		2.3	Obtain all necessary tools, equipment and testing instruments needed to verify compliance ensuring all instruments are calibrated
3.	Inspect, test and verify electrical installations	3.1	Isolate and tag circuits and equipment in accordance with procedures, where required
		3.2	Carry out a visual inspection of the electrical installation in accordance with the Testing and Verification – Visual Inspection Check List described in the Australian/New Zealand Wiring Rules
		3.3	Conduct all mandatory tests to verify that the earthing conductor resistance, insulation resistance, all polarities and circuit connections meet the requirements in accordance with the Australian/New Zealand the Wiring Rules
		3.4	Conduct optional testing to verify that the fault-loop impedance and the operation of residual current devices meet the requirements in accordance with the Australian/New Zealand the Wiring Rules
4.	Report inspection and test results	4.1	Identify and report all defects and make recommendations for rectification in accordance with SOPs
		4.2	Complete all mandatory documentation in accordance with regulatory and local supply authority requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical installations include:

- at least one (1) general electrical installation comprising a main switchboard, supplying more than one circuit each for lighting, socket outlets and fixed appliances
- at least one (1) industrial electrical installation comprising a distribution board separate from the main switchboard and at least one (1) circuit supplying a three-phase load and safety system in one of the following industrial environments:
  - factory
  - building
  - off shore platform
  - mine site processing
  - oil and gas installation
  - processing plant
  - workshop
  - underground installation
- three-phase loads include at least one (1) or more of the following:
  - motors – for pumps, conveyors, mills, agitators, crushers and screening plants
  - heaters
  - compressor packages
  - heating, ventilation and air conditioning (HVAC) units
  - facility accommodation units, sea container workshops and storage units, and laboratories
  - workshop equipment, including lathes, milling machines and welders
  - underground dewatering systems and ‘gate end’ boxes for drilling equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory requirements include:	• AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) • AS/NZS 3017:2007 Electrical installations – Verification guidelines. • AS/NZS 3018:2001 Electrical Installations – Domestic installations • AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment • AS/NZS 3012:2010 Electrical installations – Construction and demolition sites
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

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Assessment Requirements for MEM10021 Inspect, test and verify electrical installations

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining the relevant work permits and implementing appropriate risk control measures
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- preparing and following work plans in accordance with legislative and regulatory requirements and hazard and safety requirements
- reviewing all relevant documentation pertaining to the electrical installation to be inspected and tested
- consulting with all relevant personnel affected by this process
- obtaining the necessary tools, equipment and testing instruments ensuring all instruments are calibrated
- preparing a safe work method statement (SWMS) or job safety analysis (JSA) in the absence of established procedures for effective isolation
- performing a visual inspection ensuring that it meets the requirements of the Australian/New Zealand Wiring Rules – Testing and Verification Visual Inspection Check List
- performing the mandatory and optional circuit tests required for electrical cables in a range of installations and final subcircuits, including:
  - following safe testing procedures
  - testing to show if the earth continuity is sufficiently low
  - testing to show if the insulation resistance is sufficiently high
  - testing to show if the polarity and circuit connections are correct
  - testing to show earth fault-loop impedance is sufficiently low
  - performing testing to verify that residual current devices (RCDs) operate as intended
- identifying and reporting of any non-compliance defect/s and making necessary recommendations in accordance with appropriate procedures

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- completing all mandatory documentation in accordance with regulatory and local supply authority requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- isolation and lockout procedures and the purpose and use of SWMS or JSA
- tools, equipment and test instruments needed to conduct electrical installation inspection, testing and verification process
- need for calibration of instruments
- testing procedures, requirements and considerations
- visual inspection of installations for compliance with the Australian/New Zealand Wiring Rules, including:
  - general – protection against direct and indirect contact, hazardous parts, spread of fire and general condition
  - consumers mains
  - switchboards
  - wiring systems
  - electrical equipment
  - earthing
- mandatory tests, including:
  - continuity of the earthing system
  - insulation resistance
  - polarity
  - correct circuit connections
- optional tests, including:
  - fault-loop impedance
  - verification of operation of RCDs
- mandatory documentation and records as required by local supply authority, legislative and regulatory requirements
- documentation for periodic testing and tagging of electrical equipment
- inspection and testing of construction and demolition sites complying with AS/NZS 3012:2010 Electrical installations – Construction and demolition sites, and recording of tests.

Assessment Conditions

- Assessors must:
  - have vocational competency in inspecting, testing and verifying electrical installations at least to the level being assessed with relevant industry knowledge and experience

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    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM10022 Commission and decommission high and low voltage equipment or installations

Modification History

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson –industrial electrician apprenticeship training and the recognition of trade-level skills in switching, isolating, commissioning and decommissioning high voltage and low voltage electrical equipment or installations and seeking appropriate assistance.

It covers the knowledge of isolating and earthing arrangements, permit requirements for switching high voltage, appropriate assistance where required, commissioning and decommissioning procedures and safety measures.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 29 – Knowledge of the AS/NZS 3000 requirements for safety services and issues relevant to HV installations. Standards referenced for electrical installations related to transportable structures and vehicles, shows and carnivals, patient areas, marinas and boats, and construction/demolition sites.
- EPC 49 – Describe the types of potential operational situations that may be encountered in various areas of industry and the type of assistance that may be needed from more experienced industry personnel.

And

Essential Performance Capability (EPC) classified as ‘critical’:

- EPC 50 – Describe the methods of commissioning and/or decommissioning electrical equipment or an installation, using a systems approach.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 2

Pre-requisite Unit

Nil

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Competency Field

Installation and commissioning

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job requirements	1.1. Follow standard operating procedures (SOPs)
	1.2. Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3. Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4. Consult and obtain approval from authorised personnel the need to commission or decommission electrical equipment or installation
	1.5. Analyse and confirm commissioning, switching and work schedules, including drawings, plans and regulatory requirements
2. Prepare to commission or decommission electrical equipment or installation	2.1. Inspect or confirm suitability and safety of electrical equipment or installation site for required commissioning or decommissioning
	2.2. Identify and obtain WHS policies and procedures related to the requirements for commissioning or decommissioning electrical equipment or installation
	2.3. Obtain necessary tools, equipment and testing devices needed for commissioning or decommissioning electrical equipment or installation
	2.4. Brief others participating in or affected by the work on commissioning or decommissioning of electrical equipment or installation
	2.5. Prepare the site according to the work schedule to minimise risk, disruption and damage to property,

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		operations and individuals
3.	Commission or decommission electrical equipment or installation	3.1. Commission electrical equipment or installation using a systems approach, including the use of appropriate test equipment, in accordance with the approved commissioning schedule
		3.2. Verify that the performance of the installed equipment/installation through a series of tests is consistent with the customer requirements/specified design intent
		3.3. Capture and record performance data of the whole installation as the baseline for future operation and maintenance
		3.4. Decommission electrical equipment or installation using an approved decommissioning schedule, including the use of appropriate test equipment, according to requirements and established procedures
		3.5. Shut down and isolate sequentially electrical equipment or installation in preparation for repair or maintenance work using safe working practices
		3.6. Deal safely with unexpected situations during the isolation process, including, where required, the approval of an authorised person
4.	Complete commission or decommission electrical equipment or installation	4.1. Check work undertaken against work schedules for conformance with requirements and report anomalies in accordance with established procedures
		4.2. Document completion of commissioning or decommissioning of electrical equipment or installation in accordance with established procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical equipment and installations include:	• new, replaced, or extensively modified equipment or installation in one or more of the following industrial environments:
	  • factory
	  • building
	  • off shore platform
	  • mine site processing
	  • oil and gas installation
	  • processing plant
	  • workshop
	  • underground installation

Test equipment includes one or more of the following:	• multimeters • ammeters • tong testers • voltmeters • continuity testers • insulation resistance testers • appropriate proving dead meters • high potential testers
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules)
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10022 Commission and decommission high and low voltage equipment or installations

Modification History

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, specifications, commissioning, decommissioning switching schedules and instructions relevant to the work to be undertaken
- preparing and following work plans associated with commissioning and decommissioning electrical equipment or installation in accordance with legislative and regulatory requirements, hazard and safety requirements
- complying with the Australian/New Zealand Wiring Rules and regulatory requirements for high voltage and low voltage electrical equipment and installations
- selecting the appropriate measuring and testing devices
- conducting briefing sessions to all personnel participating in or affected by the work
- preparing the site, including signage, barriers and warning devices
- commissioning electrical equipment or installation using a systems approach
- verifying the performance of the installed equipment/system to meet the design requirements through a series of tests/measurements
- making adjustments, where necessary, to ensure conformance with the specified design intent
- capturing and recording performance data of the whole installation as the baseline for future operation and maintenance
- decommissioning electrical equipment or installation
- shutting down and isolating electrical equipment sequentially in preparation for maintenance or repair using lock out and tag procedures and safe working practices
- seeking assistance from authorised personnel for site specific commissioning and decommissioning of electrical equipment and installations including the need for high voltage switching
- documenting completion of commissioning/decommissioning process in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Australian/New Zealand Wiring Rules and regulatory requirements for high voltage and low voltage electrical installations
- industry personnel to be consulted for advice on commissioning or decommissioning procedures
- test and commissioning, including:
  - procedures required for a particular electrical equipment or installation
  - objectives to be achieved, including:
    - to verify proper functioning of the equipment/system after installation
    - to verify that the performance of the installed equipment/systems meet with the specified design intent through a series of tests and adjustments
    - to capture and record performance data of the whole installation as a baseline for future operation and maintenance
  - using a systems approach, including:
    - performance tests appropriate to equipment/installation to be commissioned
    - measurements required to ensure conformance to specifications
    - adjustments to be made to meet specified design and operational requirements
    - the use of appropriate test equipment
- decommissioning of electrical equipment or installation, including:
  - procedures required for a particular electrical equipment or installation
  - a working knowledge of the electrical equipment or installation in order to sequentially shut down and isolate for the purposes of repair and maintenance including using lock out and tag procedures to enable safe removal of equipment/conductors
  - types of operational forms, access authorities, permits and requirements associated with high voltage switching
- reporting requirements relevant to the electrical equipment or installation being commissioned.

Assessment Conditions

- Assessors must:
  - have vocational competency in commissioning and decommissioning high and low voltage equipment or installations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10023 Design and connect control switching of circuits for building services and industrial equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in designing and connecting control switching of circuits.

It covers basic switching and control arrangements and hazards and safety requirements associated with static electricity discharge from components.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 41 – Demonstrate the knowledge and skills to design and connect switching circuits, as per AS/NZS 3000.
- EPC 51 – Describe the functioning of basic electronic circuits used in common electrical power circuit applications including electronic logic controls, related hazards and safety requirements.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM18001	Use hand tools

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Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1.	Follow standard operating procedures (SOPs)
		1.2.	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3.	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4.	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Design control switching of circuits	2.1.	Design agreed control switching of circuits to comply with specifications and regulatory requirements
		2.2.	Document agreed design of control circuits in accordance with procedures
		2.3.	Obtain the necessary tools, equipment, test instruments and materials needed to connect the control circuits
3.	Connect control switching of circuits	3.1.	Isolate and tag circuits and equipment in accordance with procedures, where required
		3.2.	Terminate and connect control circuit components to comply with the design and regulatory requirements
		3.3.	Functional test control circuit operation to ensure compliance with agreed design
		3.4.	Rectify any non-compliances and re-test to meet requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5. Terminate and connect control circuits
	3.6. Test control circuits to ensure functionality
	3.7. Document control circuits in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control switching of circuits include five (5) or more of the following:	• multiple light switching circuit • master control circuit • local start-stop control and with electrical interlocking • connecting a timer in a controlled circuit • a multiple motor starting circuit which incorporates start, stop and jog control • machine safety circuit • line conditioners • inverters • uninterrupted power supplies (UPS) • energy management systems
Control circuit components include five (5) or more of the following:	• multi-way switches • switches with more than two positions and Off • push buttons • electromechanical relays • programmable relays • contactors

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- motor reversing contactors
- three-phase starters
- reduced voltage starters
- transducers/sensors, including:
  - limit, proximity, float and pressure switches
  - photoelectric cells
  - light and temperature sensors

Regulatory requirements include:	• AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10023 Design and connect control switching of circuits for building services and industrial equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and are up to date
- developing according to specifications at least five (5) or more of the following control circuit designs:
  - multiple light switching circuit
  - master control circuit
  - local start-stop control and with electrical interlocking
  - connecting a timer in a controlled circuit
  - a multiple motor starting circuit which incorporates start, stop and jog control
  - machine safety circuit
  - line conditioners
  - inverters
  - uninterrupted power supplies (UPS)
  - energy management systems

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- terminating and connecting to comply with the above selected control circuit scenarios and regulatory requirements at least five (5) or more of the following control circuit devices:
  - multi-way switches
  - switches with more than two positions and Off
  - push buttons
  - electromechanical relays
  - programmable relays
  - contactors
  - motor reversing contactors
  - three-phase starters
  - reduced voltage starters
  - transducers/sensors, including:
    - limit, proximity, float and pressure switches
    - photoelectric cells
    - light and temperature sensors
- programming timers and using the monitoring facility of the programmable relay to verify the values of the timer
- testing connected control circuit devices as against agreed design and rectifying any non-compliant functions
- complying with the Australian/New Zealand Wiring Rules and local supply requirements for three-phase motor installations and starters
- testing control circuits to ensure functionality
- using test equipment to locate faults, completing remedial action and retesting to ensure compliance
- documenting connected control circuits in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- electrical drawings – conventions in linework, symbols used in electrical circuit diagrams, placement and arrangement of circuit components
- drawing schematic circuit diagrams complying with Australian Drawing Standard AS/NZS 1102.101-1989 Graphical symbols for electrotechnical documentation – General information and general index, and converting to wiring diagrams
- construction and operation of contactors and relays with various types of contacts, including:
  - normally open
  - normally closed
  - timed on closing

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    - timed in opening
    - timed in both closing and opening
- drawing contactors in circuits and drawing conventions applied
- control diagrams drawn as ladder diagrams where the ladder stiles are the supply lines and the ladder rungs are the various circuit lines
- control circuit variations, including:
    - two-position control
    - local or remote operation
    - two-wire control
    - two-wire and push button control where extra start push-buttons are all placed in parallel and where extra stop push-buttons are placed in series
    - reversing circuits – use of mechanical and electrical interlocks
    - jogging control
- common control devices used in circuits, including:
    - multi-way switches
    - switches with more than two positions and Off
    - push buttons
    - electromechanical relays
    - programmable relays
    - contactors
    - motor reversing contactors
    - three-phase starters
    - reduced voltage starters
    - transducers/sensors, including:
        - limit, proximity, float and pressure switches
        - photoelectric cells
        - light and temperature sensors:
- programmable timers, including specifications to be met and functions to be controlled including machine operation or process output
- line conditioners and the purpose they provide
- inverters and the purpose they provide
- energy management systems and the purpose they provide
- static electricity discharge or electrostatic discharge and the hazards associated and the precautions to be taken.

Assessment Conditions

- Assessors must:
    - have vocational competency in designing and connecting control switching of circuits for building services and industrial equipment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10024 Install and troubleshoot luminaires and ancillary equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in installing and troubleshooting luminaires and ancillary equipment in accordance with the relevant standards.

It covers a basic understanding of the various types of faults, luminaires and the purpose components and ancillary equipment for operating voltages up to 1000 V alternating current (AC) or 1500 V direct current (DC) and related hazard and safety requirements.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capability (EPC):

- EPC 53 – Demonstrate an understanding of the basic operation and energy efficiency of the various types of luminaires and the purpose of components and ancillary equipment including related hazards and their safety requirements.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM10023	Design and connect control switching of circuits for building services and industrial equipment

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MEM18001 Use hand tools

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job requirements	1.1. Follow standard operating procedures (SOPs)
	1.2. Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3. Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4. Determine through the interpretation of electrical diagrams, drawings, lighting standards and/or from consultation the luminaire and ancillary equipment requirements for the electrical installation
2. Install luminaires and ancillary equipment	2.1. Obtain the number and type of luminaires and associated ancillary equipment through established procedures
	2.2. Obtain necessary tools, equipment and testing instruments needed for installing luminaires and ancillary equipment
	2.3. Isolate and tag circuits and equipment in accordance with procedures, where required
	2.4. Install luminaires and accessories complying with job specifications, and regulatory and legislative requirements
	2.5. Check installed accessories are straight and square in the required locations and within acceptable tolerances
	2.6. Terminate lighting circuits to luminaires, switches and other control devices in accordance with manufacturer

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		specifications and regulatory requirements
	2.7.	Test luminaires and ancillary equipment to ensure compliance
3. Troubleshoot luminaires and ancillary equipment	3.1.	Identify the fault and resulting safety hazards and implement risk control measures in consultation with appropriate personnel
	3.2.	Apply diagnostic techniques to troubleshoot luminaires, ancillary equipment and associated lighting circuits using appropriate test equipment
	3.3.	Repair/replace faulty circuits/components according to manufacturer specifications and regulatory requirements
	3.4.	Test repaired/replaced circuit/component for functionality in accordance with regulatory requirements
	3.5.	Dispose of discharge lamps in accordance with environmental guidelines and procedures
	3.6.	Document installation and troubleshooting of luminaires, ancillary equipment and associated circuits in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Lighting standard includes:	• AS/NZS 1680.1:2006 Interior and workplace lighting general principles and recommendations
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules • National Construction Code (NCC) Australia or building code (NZ)
Faults include:	• fluorescent light circuits, including lamp, ballast and starter • metal Halide and high-pressure sodium (HPS) lighting and circuits, including capacitor, poor connection, igniter and ballast • extra-low voltage (ELV) lighting devices, including transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections and incompatible dimmers • lighting control circuits, including manual control, passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks • lighting management systems

Lighting circuits include two (2) or more of the following:	• single light controlled by a single switch
	• multiple lights controlled by a single switch
	• two and three-way switching using:
	  • loop at the light method
	  • loop at the switch method

Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

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Links

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Assessment Requirements for MEM10024 Install and troubleshoot luminaires and ancillary equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, specifications and plans relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and up to date
- installing accessories ensuring that they are straight and square in the required location
- using safe working practices and take additional care when working with lights that operate at high voltage or contain capacitors
- terminating two (2) or more of the following lighting circuits:
  - single light controlled by a single switch
  - multiple lights controlled by a single switch
  - two and three-way switching using:
    - loop at the light method
    - loop at the switch method
- complying with the Australian/New Zealand Wiring Rules requirements for the installation and termination of lighting equipment and accessories, including related hazards and safety requirements including maintaining fire integrity
- measuring and recording illumination for comparison against lighting standard AS/NZS 1680.1:2006 Interior and workplace lighting – General principles and recommendations, using a suitable light meter
- locating and repairing faults in luminaires and ancillary equipment

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- troubleshooting and repairing faults in common lighting circuits
- replacing lamps with ‘like for like’
- performing periodic servicing of emergency lighting and smoke detector systems and recording intervals of servicing, including remedial action taken
- disposing of discharge lamps according to environmental guidelines and established procedures
- documenting installation and troubleshooting, including remedial action taken in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- lighting applications, including:
  - basic principles, terminology and units in describing process and concepts of illumination
  - the major design requirements of luminaires regarding reflection or diffusion of light and direct the light onto the working place
  - functional category types of luminaires:
    - direct with 90-100% downward light component
    - indirect with 90-100% upward light component
    - general diffusing with approximately equal upward and downward components
    - semi direct with 10-40% upward and 60-90% downward
    - semi direct with 60-90% upward and 10-40% downward
  - maintenance of luminaires, including lamp replacement and cleaning
  - common faults in luminaires
  - disposal of discharge lamps in accordance with environmental guidelines and established procedures
  - elementary lighting design, including:
    - requirements to clearly show up the task or work area
    - recommended maintenance luminance
    - the advantages of the use of reflectors and diffusers
    - determining illuminance on a working plane using the ‘point by point’ method and lumen method
    - the use of a lux meter to determine lighting and illumination requirements
  - emergency evacuation lighting in buildings, including:
    - escape and standby lighting
    - installation requirements of emergency lighting luminaires
    - installation of smoke detection in domestic and residential premises
    - inspection and maintenance of emergency lighting and smoke detectors
    - recording requirements

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- light sources, including:
  - lamp type and their characteristics
  - the operating principles of various types of lamps and luminaries and the purpose of their auxiliary control equipment
  - energy efficiency
  - the cause of low power factor and the measures used to improve power factor in discharge lighting
  - Australian/New Zealand Wiring Rules requirements for the installation of lighting equipment and accessories, including related hazards and safety requirements
  - application of various types of lamps and luminaires
  - 'stroboscopic effect' and the methods used to overcome, including:
    - 'non-stroboscopic' circuit (inclusion of a capacitor in one fluorescent lamp circuit to provide phase shift in relation to the other lamp circuit)
    - connecting adjacent lamps to different phases in large installations
    - electronic lamp circuits operating at high frequencies
- lighting circuits, including:
  - single light controlled by a single switch
  - multiple lights controlled by a single switch
  - two and three-way switching using the loop at the light method and the loop at the switch method
- lighting control, including:
  - manual control involving the use of two-way and intermediate switches
  - time switches both analogue and digital for programmed control
  - time delay switches that are adjustable and may be air-valve or electronic type
  - photo-sensitive electronic control used to control outdoor and street lighting
  - passive infrared (PIR) technology used in scanning devices to detect movement of a hot or cold body and automatically switch on security or convenience lighting
  - various types light dimmers, including electronic
  - lighting management systems, e.g. C-Bus.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing and troubleshooting luminaires and ancillary equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM10025 Undertake a capstone assessment

Modification History

Release 4. Prerequisite units updated

Release 3. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 2. Equivalent - correction to include missing prerequisites

Release 1. New unit

Application

This assessment is to be carried out after the completion of all other assessment requirements of the units of competency that make up MEM31219 Certificate III in Engineering – Industrial Electrician and prior to application for an Electrical Licence.

This assessment is to be carried out at the premises of the Registered Training Organisation (RTO) and is expected to be conducted by an assessor other than the one who has been a regular instructor to the apprentice.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 2 – Demonstrate a knowledge of the various effects of electric current.
- EPC 5 – Explain the operation of a simple practical circuit. Determine the resistance, voltage, current and power in any part of a DC circuit using theory and actual measurement methods.
- EPC 8 – Demonstrate a knowledge of alternating voltage & current generation, phase relationships, energy in an AC circuit, and actual measurement methods.
- EPC 10 – Demonstrate an understanding of the fundamental principles of the AS/NZS 3000 Part 1. Knowledge of the hierarchy of standards. Nomative/informative text.
- EPC 13 – Demonstrate a knowledge of methods of electric motor selection, starting, connection and protection.
- EPC 16 – Describe and apply in practice the requirements of AS/NZS 3000 in relation to earthing arrangements and fault loop impedance calculations. Knowledge of alternate earthing systems when required by local Regulatory Authorities.
- EPC 17 – Demonstrate a comprehensive knowledge and understanding of the MEN system and its application, including on sub-installations. Demonstrate how to test a MEN system.
- EPC 19 – List the key safety issues of various types of transformers, including AS/NZS 3000 requirements.
- EPC 20 – Demonstrate a knowledge of the SELV and PELV systems, their application and testing in accordance with AS/NZS 3000.

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- EPC 21 – Demonstrate the ability to select cables for mains and submains using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capacity, maximum demand and voltage drop, for single phase and three phase installations including multiple installations.
- EPC 22 – Demonstrate the ability to select cables for final subcircuits using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capacity, maximum demand, earth loop impedance and voltage drop.
- EPC 23 – Describe and apply the control and protection requirements for installations and equipment. Demonstrate the ability to select suitable equipment and switchgear for a particular installation or part of an installation using AS/NZS 3000.
- EPC 24 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the location of switchboards and arrangement of switchboard equipment in installations. Methods for determining prospective fault current. Switchboard form types.
- EPC 25 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the installation of electrical equipment in given damp situations and wet areas. IP rating of electrical equipment.
- EPC 26 – Demonstrate the appropriate methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation. Need for calibration of instruments.
- EPC 27 – Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring. Including specialist cables.
- EPC 28 – Demonstrate a knowledge of the AS/NZS 3000 requirements for electrical installations in hazardous areas and an awareness of the standards to which it refers.
- EPC 30 – Demonstrate to AS/NZS 3000 and AS 3017 standards the electrical checks and tests required to ensure electrical installations are safe, reporting of test results typically required to satisfy regulatory requirements.
- EPC 31 – Demonstrate the knowledge and skill to perform effective safe isolation of any equipment, including switch and lock off, circuit isolation, equipment testing and tag out procedures, including capacitor banks.
- EPC 35 – Demonstrate the knowledge and skill to install and terminate a variety of electrical cables in a wide range of applications (including final subcircuits) to AS/NZS 3000.
- EPC 37 – Demonstrate knowledge and skills to install final subcircuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and local supply authority requirements.
- EPC 38 – Connect consumers mains to an installation, in accordance with AS/NZS 3000 and local supply authority requirements.
- EPC 40 – Demonstrate ability to read, sketch and interpret electrical diagrams and specifications.
- EPC 42 – Describe basic statutory occupational safety and health responsibilities for employers and employees, including supervisory requirements and employees’ own "duty of care". Asbestos awareness and reporting. Hazardous gases.
- EPC 43 – Demonstrate understanding of the requirements for personal safety in the workplace and application of safety practices.

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- EPC 44 – Describe a workplace safety check, identify potential workplace hazards and suggest measures for accident prevention.
- EPC 46 – Describe the method of rescuing a person in contact with live electrical conductors or equipment.
- EPC 47 – Describe the emergency first aid requirements for an electric shock victim and demonstrate the knowledge and application skill of CPR.
- EPC 48 – Demonstrate knowledge and understanding of the significant dangers of High Voltage equipment and distribution systems.
- EPC 50 – Describe methods of commissioning and/or decommissioning electrical equipment or an installation, using a systems approach.
- EPC 54 – Demonstrate the knowledge and skills for diagnosing and rectifying faults in electrical apparatus and associated circuits.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 1

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM10020	Install low voltage cabling and fit-off accessories, appliances and equipment
MEM10021	Inspect, test and verify electrical installations
MEM10022	Commission and decommission high and low voltage equipment or installations
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM10024	Install and troubleshoot luminaires and ancillary equipment
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM13017	Apply safety practices, procedures and compliance standards associated with licensed electrical work

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MEM17003	Assist in the provision of on-the-job-training
MEM18001	Use hand tools
MEM18100	Fault-find, test and rectify AC machines and circuits
MEM18102	Fault-find, test and rectify single and three-phase transformers
MEM18103	Fault-find, test and rectify electrical circuits and equipment
MEM18104	Dismantle, replace and assemble electrical components and equipment
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG102A	Solve problems in low voltage a.c. circuits

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Prepare to undertake a capstone assessment	1.1. Follow standard operating procedures (SOPs)
	1.2. Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3. Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4. Identify practical assessment requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2.	Carry out practical assessment	2.1.	Obtain necessary tools, equipment and testing devices needed for completing the practical assessment and check for correct operation and safety
		2.2.	Select cable types and sizes to suit loads and electrical installation environment
		2.3.	Select circuit protection devices by type and rating
		2.4.	Install and terminate low voltage (LV) cabling and wiring, fit off accessories, appliances and equipment in accordance with specifications and regulatory requirements
		2.5.	Inspect, test and verify electrical installation to ensure compliance with regulatory requirements
		2.6.	Rectify all non-compliance defects and re-test to ensure compliance
3.	Carry out a theory assessment	3.1.	Obtain all applicable standards and other approved reference books relevant to the test being undertaken
		3.2.	Complete the written component of the capstone assessment within the allocated timeframe
4.	Complete the capstone assessment	4.1.	Demonstrate fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
		4.2.	Satisfy the minimum requirements of both the written and practical component of the capstone assessment
		4.3.	Demonstrate fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
		4.4.	Satisfy the minimum requirements of both the written and practical component of the capstone assessment

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Assessment requirements include:	• as described by the National Uniform Electrical Licensing Advisory Council or its successor – Capstone assessment requirements for prospective electricians include the following:
	  • all ‘critical items’ of the EPCs list
	  • may be an ‘open book’ style, with the permitted use of standards and published reference books (programmable calculators, computers and personal notes are to be excluded)

Capstone assessment includes:	• written component – objective assessment methods to be used, including a sensible proportion of multiple choice questions (‘essay style’ to be avoided) and some written answers to the objective questions, aimed at demonstrating a trainee’s understanding of the ‘critical’ aspects as specified in the EPC list • practical component – required demonstration of fundamental knowledge and comprehension of electrical concepts and safety principles, as specified in the ‘critical’ items of the EPC list, using (where possible) problems that test a combination of practical and theoretical knowledge and skills
Duration of capstone assessment includes:	• one full working day to complete, with the practical component representing about 70% of the whole test, e.g. written test 2-3 hours and practical test 4-6 hours
Minimum requirements of the capstone	• written – the apprentice is required to demonstrate satisfactory performance in every ‘critical’ item tested

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

assessment include:	• practical – the apprentice is required to have demonstrated *****competence for the 'critical' items tested ***Note:** Competence in this setting means that it is evident that the person comprehends the key safety issues and the practical work performed does not suffer from any defects of the kind categorised as 'serious' by Electrical Regulators
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 3. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities and inclusion of missing prerequisites.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM10025 Undertake a capstone assessment

Modification History

Release 4. Prerequisite units updated

Release 3. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 2. Equivalent - correction to include missing prerequisites

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- demonstrating fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- obtaining the necessary tools, equipment and testing devices ensuring that they are checked for safety and operation
- undertaking the necessary calculations in determining current carrying capacity, short circuit capacity, maximum demand and voltage drop and earth loop impedance for the given installation
- selecting cables ensuring coordination between protective devices and conductors in accordance with specifications and regulatory requirements
- selecting and installing suitable switch gear and circuit protection devices complying with specifications and regulatory requirements
- installing and terminating low voltage cabling and wiring; fitting off accessories, appliances and equipment in accordance with specifications and regulatory requirements
- performing a visual inspection ensuring that it meets the requirements of the Australian/New Zealand Wiring Rules – Testing and Verification Visual Inspection Check List
- performing the mandatory and optional circuit tests required for electrical cables in a range of installations and final subcircuits, including:
  - following safe testing procedures
  - testing to show if the earth continuity is sufficiently low
  - testing to show if the insulation resistance is sufficiently high
  - testing to show if the polarity and circuit connections are correct

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  - testing to show earth fault-loop impedance is sufficiently low
  - performing testing to verify that residual current devices (RCDs) operate as intended
- demonstrating how to test a multiple earthed neutral (MEN) system
- identifying and rectifying of any non-compliance defect/s and retesting to ensure compliance
- completing all mandatory documentation in accordance with regulatory and local supply authority requirements
- completing the written component of the capstone assessment in the allocated timeframe
- satisfying the minimum requirements of both the written and practical component of the capstone assessment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- various effects of electric current
- operation of a simple practical circuit
- determination of resistance, voltage, current and power in any part of a direct current (DC) circuit using theory and actual measurements
- alternating voltage and current generation, phase relationships, energy in an alternating current (AC) circuit and actual measurement methods
- understanding of the scope, application and fundamental principles of AS/NZS 3000: 2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) Part 1
- methods of electric motor selection, starting, connection and protection
- requirements and its application of Australian/New Zealand Wiring Rules in relation to earthing arrangements and fault-loop impedance calculations
- alternate earthing systems when required by local regulatory authorities
- understanding of the MEN system and its application, including on sub-installations
- applications of transformers and key safety issues
- requirements and application of Australian/New Zealand Wiring Rules in relation to circuit protection and other relevant Australian Standards e.g. AS/NZS 3018:2001 Electrical installations – Domestic installations (or its equivalent updated version)
- requirements and application of Australian/New Zealand Wiring Rules in relation to separated extra-low voltage (SELV) and protected extra-low voltage (PELV) systems, their application and testing
- cable selection for mains and submains using Australian/New Zealand Wiring Rules and AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions based on current carrying capacity, short circuit capacity, maximum demand and voltage drop for single-phase and three-phase installations, including multiple installations

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- cable selection for final subcircuits using Australian/New Zealand Wiring Rules and AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions based on current-carrying capacity, short circuit capacity, earth loop impedance and voltage drop
- control and protection requirements for installations and equipment and the ability to select suitable equipment, switchgear and RCDs for a particular installation or part of an installation
- minimum fault levels specified by electricity network operator
- requirements and application of Australian/New Zealand Wiring Rules in relation to location of switchboards and arrangement of switchboard equipment in installations
- methods of determining prospective fault current
- switchboard form types
- installation of electrical equipment in given damp situations and wet areas in accordance with Australian/New Zealand Wiring Rules and regulatory requirements
- Ingress Protection (IP) rating of electrical equipment
- installation, modification and testing of electrical installations and equipment for construction and demolition sites complying with AS/NZS 3012:2010 Electrical installations – Construction and demolition sites, and applicable workplace safety legislation
- need for calibration of instruments
- requirements of Australian/New Zealand Wiring Rules in relation to the installation of aerial conductors, underground wiring and specialist cables
- requirements Australian/New Zealand Wiring Rules in relation for electrical installations in hazardous areas and awareness of the standards to which it refers
- additional training required to work competently with electrical equipment for hazardous areas
- electrical tests and checks to be performed as required by Australian/New Zealand Wiring Rules and AS 3017:2007 Electrical installations – Verification guidelines to ensure electrical installations are safe
- reporting of test results typically required to satisfy regulatory requirements
- effective safe isolation of any equipment, including capacitor banks, including switch and lock off, circuit isolation, equipment testing and tagging procedures
- installation and termination requirements for a variety of cables in a wide range of applications (including final subcircuits to Australian/New Zealand Wiring Rules
- circuit tests requirements for electrical cables in a range of installations, with attention to final subcircuits
- installation requirements of final subcircuit wiring into switchboards and connection to switchboard equipment in accordance with Australian/New Zealand Wiring Rules and local supply authority requirements
- connection requirements of consumer mains to an installation in accordance with Australian/New Zealand Wiring Rules and local supply authority requirements
- reading, sketching and interpretation of electrical diagrams and specifications

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- basic statutory work health and safety (WHS) responsibilities for employers and employees, including supervisory requirements and employees' own 'duty of care', including asbestos awareness and hazardous gases
- requirements for personal safety in the workplace, including safe isolation and application of safety practices
- workplace safety checks, identification of potential workplace hazards and working with others to suggest measures for accident prevention
- method of rescuing a person in contact with live electrical conductors or equipment
- emergency first aid requirements for an electric shock victim and demonstrate the knowledge and application skill of cardiopulmonary resuscitation (CPR)
- understanding of the significant dangers of high voltage equipment and distribution systems
- methods of commissioning and/or decommissioning electrical installation using a systems approach
- diagnosing and rectifying faults in electrical apparatus and associated circuits.

Assessment Conditions

- Assessors must:
  - hold a current electrical licence be an assessor other than the one who has been a regular instructor to the apprentice
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires
- The capstone assessment is an entirely RTO conducted assessment at the RTO's chosen location where the entire assessment needs to be carried out in one day.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11001 Erect/dismantle scaffolding and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11001C Erect/dismantle scaffolding and equipment

Application

This unit of competency defines the skills and knowledge required to prepare, erect and dismantle scaffolding and equipment for maintenance and installation in a workshop and in factories, manufacturing plants and warehouses.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Interpret site plans, scaffolding/equipment designs and drawings to industry practices, as necessary
2	**Prepare to erect scaffold/equipment**	2.1	Inspect work area to identify hazards and implement appropriate prevention/control measures to avoid hazard
		2.2	Prepare erection site to meet job requirements
		2.3	Place necessary signage and barriers and third-party protection measures in appropriate position
3	**Erect scaffold/equipment**	3.1	Select and inspect appropriate scaffolding/equipment components and label and reject damaged components
		3.2	Erect scaffolding/equipment to plan and in accordance with safe work practices, Australian Standards, state and territory legislative requirements and equipment manufacturers' requirements
		3.3	Check the completed scaffolding/equipment for safety and operational requirements
		3.4	Leave site clear of all surplus components, equipment, tools and debris
4	**Inspect, repair**	4.1	Repair or send for repair rejected components

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	and alter scaffold/equipment	4.2	Inspect the scaffolding/equipment for damage, corrosion and wear
		4.3	Carry out any alteration or repair in accordance with safe work practices and legislative requirements
		4.4	Complete any inspection log, as required
5	**Dismantle scaffold/equipment**	5.1	Inspect scaffolding/equipment for damage, corrosion or wear and note for consideration in planning for dismantling
		5.2	Dismantle scaffolding/equipment in accordance with site procedures, state and territory legislative requirements and critical structural and safety requirements
		5.3	Clean and clear site of all tools, excess material and debris and leave in a safe state

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Scaffolding/equipment includes one (1) or more of the following:	• modular or prefabricated scaffolds • cantilevered materials hoists with a maximum working load of 500 kg • ropes and gin wheels • safety nets and static lines • bracket scaffolds (tank and formwork)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:

- chemicals
- dangerous or hazardous substances/materials
- movement of equipment, goods and materials
- vehicular traffic
- uneven/unstable terrain
- overhead service lines
- trees
- underground services
- obstructions
- structures
- surrounding buildings
- facilities
- bridges/walkways
- lifting equipment

Prescribed procedures include one (1) or more of the following:

- clarification of instructions and/or plans either written or from authorised personnel
- site safety policy and procedures
- SOPs
- correct use of equipment
- industry standards and requirements
- manufacturers' specifications

Signage and barriers and third-party protection measures include one (1) or more of the following:

- physical barriers (para webbing, bollards, timber or metal barriers)
- warning/direction signs
- personnel to restrict unauthorised access (spotters)
- permits to work

Safe work practices include the following:

- hazard identification
- risk assessment
- risk reduction measures
- housekeeping
- PPE

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

State and territory legislative requirements include the following:

- appropriate WHS and Scaffolding Acts and regulations
- Australian Standards and codes of practice, including:
  - NOHSC:1006, National Occupational Health and Safety Certification Standards for Users and Operators of Industrial Equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11001C Erect/dismantle scaffolding and equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11001 Erect/dismantle scaffolding and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11001C Erect/dismantle scaffolding and equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and legislative requirements for erecting scaffolding
- preparing the site for erection of scaffolding
- assessing the risks associated with erecting/dismantling scaffolding and equipment and determining the most appropriate technique
- using relevant hand tools and manual handling techniques ensuring the scaffolding is level
- undertaking site clean-up and remediation
- working safely and confidently at heights.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- erection and dismantling procedures as set out in relevant Australian Standards
- codes of practice, for example, the Scaffolder's Guide, and relevant acts and regulations
- site specific requirements
- scaffolding techniques and equipment and its limitations
- materials handling, storage and environmentally friendly waste management.

Assessment Conditions

- Assessors must:
  - have vocational competency in erecting/dismantling scaffolding and equipment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11002 Erect/dismantle intermediate scaffolding and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11002C Erect/dismantle complex scaffolding and equipment

Application

This unit of competency defines the skills and knowledge required to prepare, erect, maintain, inspect/alter/repair and dismantle intermediate scaffolding/equipment used generally in maintenance and installation in workshops, factories, manufacturing plants and warehouses.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where scaffolding alteration or repair work is undertaken appropriate units should also be selected.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11001	Erect/dismantle scaffolding and equipment
MEM11011	Undertake manual handling

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Interpret site plans, scaffolding/equipment designs and drawings to industry practices, as necessary
2	**Prepare to erect intermediate scaffold/equipment**	2.1	Inspect work area to identify hazards and implement appropriate prevention/control measures to avoid hazard
		2.2	Prepare erection site to meet job requirements
		2.3	Place necessary signage and barriers and third-party protection measures in appropriate position
3	**Erect intermediate scaffold/equipment**	3.1	Select and inspect appropriate scaffolding/equipment components and label and reject damaged components
		3.2	Erect scaffolding/equipment to plan and in accordance with acceptable safe work practices, Australian Standards, state or territory legislative requirements and equipment manufacturers' requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Check scaffolding/equipment for safety and operational requirements and identify faults in accordance with legislative requirements
4	**Inspect, alter and/or repair intermediate scaffold/equipment**	4.1	Repair or send for repair rejected components
		4.2	Confirm alterations/repairs in accordance with safe work practices, Australian Standards and equipment manufacturers' requirements
		4.3	Inspect alterations/repairs for safety and operational requirements
		4.4	Confirm and understand scope of alteration/repair
		4.5	Inspect existing scaffold/equipment for suitability of alterations/repair requirements
		4.6	Determine materials, equipment and tools required for alteration
		4.7	Record/report work completion to appropriate authority
5	**Dismantle intermediate scaffold/equipment**	5.1	Inspect scaffolding/equipment for damage, corrosion or wear and note for consideration in planning for dismantling
		5.2	Dismantle scaffolding/equipment in accordance with site procedures, state and territory legislative requirements and critical structural and safety requirements
		5.3	Clear and clean site of all tools, excess material and debris and leave in a safe state

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Scaffolding/equipment includes one (1) or more of the following:

- modular or prefabricated scaffolds
- cantilevered materials hoists with a maximum working load of 500 kg
- ropes and gin wheels
- safety nets and static lines, and
- bracket scaffolds (tank and formwork)
- cantilevered crane loading platforms
- cantilevered and spurred scaffolds
- barrow ramps and sloping platforms
- perimeter safety screens and shutters
- mast climbers
- tube and coupler scaffolds (including tube and coupler covered ways and gantries)

Maintaining scaffold includes the following:

- ensuring that the scaffolding remains in a safe condition according to manufacturers' specifications and legislative requirements

Hazards include one (1) or more of the following:

- chemicals
- dangerous or hazardous substances/materials
- movement of equipment, goods and materials
- vehicular traffic
- uneven/unstable terrain
- overhead service lines
- trees
- underground services
- obstructions
- structures
- surrounding buildings
- facilities
- bridges/walkways
- lifting equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Prescribed procedures include one (1) or more of the following:	• clarification of instructions either written or from authorised personnel • site safety policy and procedures • SOPs • correct use of equipment • industry standards and requirements • manufacturers' specifications
Signage, barriers and third-party protection measures include one (1) or more of the following:	• physical barriers (para webbing, bollards, timber or metal) • warning/direction signs • personnel to restrict unauthorised access (spotters) • permits to work
Safe work practices include the following:	• hazard identification • risk assessment • SOPs • housekeeping • PPE
State or territory legislative requirements include the following:	• appropriate WHS and Scaffolding Acts and regulations • Australian standards and codes of practice, including: • NOHSC:1006, National Occupational Health and Safety Certification Standards for Users and Operators of Industrial Equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11002C Erect/dismantle complex scaffolding and equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11002 Erect/dismantle intermediate scaffolding and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11002C Erect/dismantle complex scaffolding and equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, legislative requirements for erecting intermediate scaffolding
- preparing the site for erection of intermediate scaffolding
- assessing the risks associated with intermediate scaffolding and equipment and determining the most appropriate technique
- using relevant hand tools and manual handling techniques ensuring the intermediate scaffolding is level
- determining the condition of scaffolding and determining the need for repair or alteration
- undertaking alteration or repair work on scaffolding or sending the scaffolding for repair or alteration.
- undertaking site clean-up and remediation
- working safely and confidently at heights.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- erection and dismantling procedures as set out in relevant Australian Standards
- codes of practice, for example, the Scaffolder's Guide, and relevant acts and regulations
- site-specific requirements
- sequence of operations in erecting intermediate scaffolding
- types of intermediate scaffolding systems and deck loadings
- scaffolding techniques and equipment and its limitations
- materials handling, storage and environmentally friendly waste management
- scaffolding condition and repair requirements

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- hazards and control measures; electrical, stability, mobile plant issues/requirements; falls protection measures; minimum gap requirements; and safe access and egress.

Assessment Conditions

- Assessors must:
  - have vocational competency in erecting/dismantling intermediate scaffolding and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11003 Coordinate erection/dismantling of complex scaffolding/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11003B Coordinate erection/dismantling of complex scaffolding/equipment

Application

This unit of competency defines the skills and knowledge required to coordinate the erection, alteration, repair and dismantling of scaffolding/equipment in workshops, factories, manufacturing plants and warehouses, and applies to individuals coordinating a scaffolding team or employed in a supervisory capacity.

Complex scaffolding means intermediate scaffolding and above as set out the legislative requirements in each state and territory. The major difference between the complex and basic scaffolding is the height of the working platform and certain types of scaffolding and configurations.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11001	Erect/dismantle scaffolding and equipment

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MEM11002	Erect/dismantle intermediate scaffolding and equipment
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Interpret site plans, scaffolding/equipment designs and drawings to industry practices, as necessary
2	**Plan and coordinate erection of complex scaffold/equipment**	2.1	Inspect work area to identify hazards and implement appropriate prevention/control measures to avoid hazard
		2.2	Prepare erection site to meet job and safety requirements
		2.3	Place necessary signage and barriers in appropriate position
		2.4	Coordinate scaffolding/equipment erection in accordance with acceptable safe work practices, Australian Standards, state or territory legislative requirements and equipment manufacturers' requirements
		2.5	Inspect completed scaffolding/equipment for safety and

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			compliance with design, operational and statutory requirements
3	**Coordinate alterations and repairs of complex scaffold/equipment**	3.1	Confirm and understand scope of alteration/repair
		3.2	Inspect existing scaffolding/equipment and determine alterations/repairs
		3.3	Determine materials, equipment and tools required for alterations
		3.4	Determine existing or new load requirements using load tables
		3.5	Coordinate alteration/repairs in accordance with safe work practices, Australian Standards and equipment manufacturers' requirements
		3.6	Inspect alterations/repairs for safety and operational requirements
		3.7	Report work completion to appropriate personnel and record
4	**Inspect erected complex scaffold/equipment**	4.1	Inspect the critical structural and safety areas of the scaffolding/equipment for damage, corrosion and wear
		4.2	Check scaffolding/equipment and structure against the type of scaffolding/equipment and structure specified in the plan
		4.3	Complete inspection log and report potential safety and design/structural hazards for rectification
5	**Coordinate dismantling of complex scaffold/equipment**	5.1	Coordinate removal of scaffolding/equipment from site in accordance with procedures and critical structural and safety requirements
		5.2	Coordinate site clearance and remove surplus material, equipment, tools and debris and leave site in safe and operational state

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.3 Report work completion to appropriate authority

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Scaffolding/equipment includes one (1) or more of the following:	• modular or prefabricated scaffolds • cantilevered materials hoists with a maximum working load of 500 kg • ropes and gin wheels • safety nets and static lines, and • bracket scaffolds (tank and formwork) • cantilevered crane loading platforms • cantilevered and spurred scaffolds • barrow ramps and sloping platforms • perimeter safety screens and shutters • mast climbers • tube and coupler scaffolds (including tube and coupler covered ways and gantries) • cantilevered hoists • hung scaffolds, including scaffolds hanging from tubes, wire ropes or chains • suspended scaffolds
Hazards include one (1) or more of the following:	• chemicals • dangerous or hazardous substances/materials • movement of equipment, goods and materials • vehicular traffic

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- uneven/unstable terrain
- overhead service lines
- trees
- underground services
- obstructions
- structures
- surrounding buildings
- facilities
- bridges/walkways
- lifting equipment

Prescribed procedures include one (1) or more of the following:

- clarification of instructions either written or from authorised personnel
- site safety policy and procedures
- SOPs
- correct use of equipment
- industry standards and requirements
- manufacturers' specifications

Signage and barriers include one (1) or more of the following:

- physical barriers (para webbing, bollards, timber or metal barriers)
- warning/direction signs
- personnel to restrict unauthorised access (spotters)
- permit signage

Safe work practices include the following:

- hazard identification
- control measures
- risk assessment
- standard operating procedures
- housekeeping
- PPE

State or territory legislative requirements include the following:

- appropriate WHS and Scaffolding Acts and regulations
- Australian standards and codes of practice, including:
  - NOHSC:1006, National Occupational Health and Safety Certification Standards for Users and Operators of

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Industrial Equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11003B Coordinate erection/dismantling of complex scaffolding/equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11003 Coordinate erection/dismantling of complex scaffolding/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11003B Coordinate erection/dismantling of complex scaffolding/equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, specifications and legislative requirements for erecting complex scaffolding
- determining existing or new load requirements using load tables
- coordinating the following:
- preparation of the site
- basic levelling and alignment of scaffolding
- assess the risks associated with erecting/dismantling complex scaffolding and equipment and determine the most appropriate technique
- appropriate use of relevant hand tools and manual handling techniques
- determining personnel and equipment requirements, including working safely and confidently at heights
- time management
- clean-up and site remediation
- inspecting completed scaffolding with reference to structural integrity and design faults
- completing inspection log in accordance with procedures and legislative requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- erection and dismantling procedures as set out in the Australian Standards
- codes of practice, for example, the Scaffolder's Guide
- site-specific requirements
- types of scaffolding systems and deck loadings
- using load tables to determine existing or new load requirements
- sequence of operations in erecting and dismantling the scaffolding

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- design and materials faults, including rust, wear and tear and stress
- scaffolding techniques and equipment and its limitations
- materials handling, storage and environmentally friendly waste management
- hazards; electrical, stability, mobile plant issues/requirements; falls protection measures; minimum gap requirements; and safe access and egress.

Assessment Conditions

- Assessors must:
  - have vocational competency in coordinating erection/dismantling of complex scaffolding/equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11004 Undertake dogging

Modification History

Release 1. Supersedes and is equivalent to MEM11004B Undertake dogging

Application

This unit of competency defines the skills and knowledge required to attach slings to loads and move loads using appropriate communication and signalling methods with a crane driver in a workshop or on-site.

This unit is not intended to apply to machine loading and simple straight lifts where knowledge of codes and signals is not required.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Attach lifting gear to loads**	2.1	Identify potential hazards associated with the use of cranes and other load shifting equipment and plan measures to eliminate or control these hazards
		2.2	Obtain site information, as necessary
		2.3	Inspect load and determine best lifting method
		2.4	Select load shifting equipment appropriate to load
		2.5	Inspect lifting gear and label and reject damaged or worn items
		2.6	Calculate safe working loads to Australian Standards, as appropriate
		2.7	Attach lifting gear to load in most appropriate and safe manner and to specifications, as required
3	**Move loads**	3.1	Perform load moving to acceptable safe working practices, Australian Standards, codes of practice and specifications
		3.2	Connect lifting gear to load shifting equipment using safe and appropriate techniques
		3.3	Use communication and signalling methods to coordinate the load movement in a safe manner
		3.4	Ground load or put down in accordance with prescribed procedure, in a safe and stable manner

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Detach all lifting gear from load mover and load

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:	• overhead power lines • trees • overhead service lines (steam, gas, water, telephone) • underground services • uneven and/or unstable ground • allowable floor loading as appropriate • other workers and persons • surrounding buildings/vessels/structures equipment • hazardous materials • corrosive substances • barricades • inadequate lighting • radio interference
Load shifting equipment includes one (1) or more of the following:	• overhead cranes • overhead gantry • forklift with approved lifting boom/jib • mobile cranes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Lifting method includes the following:	• slings in an appropriate configuration
Lifting gear includes one (1) or more of the following:	• tags • slings • ropes • shackles • lifting clutches • snatch blocks • I bolts • spreader beams • chain blocks • chain shorteners and include equalising sheaves • collared I bolts • turn buckles • rigging screws • lifting lugs
Calculations include the following:	• load and lifting gear calculations
Safe working practices include the following:	• inspection of the environment, assessment of hazards and personnel safety
Communication and signalling methods include the following:	• signals are given both within sight and out of sight of equipment operators • signals, including stop, raise, lower, slew, luff, extend and retract boom, using hands, verbal instructions and whistles

State or territory legislative requirements include the following:	• appropriate WHS and acts and regulations
	• Australian Standards and codes of practice, including:
	  • NOHSC:1006, National Occupational Health and Safety Certification Standards for Users and Operators of Industrial Equipment
	  • AS 1418 Set-2011, Cranes, hoists and winches Set

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11004B Undertake dogging

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11004 Undertake dogging

Modification History

Release 1. Supersedes and is equivalent to MEM11004B Undertake dogging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting lifting methods and load shifting equipment appropriate to the task
- calculating safe working loads
- assessing the hazards and risks associated with undertaking dogging and determining the most appropriate technique
- attaching lifting gear using appropriate techniques
- using communicating and signalling methods in the movement of the load, including when the load is out of view of the crane driver
- using basic hand tools relating to lifts
- identifying damaged/worn lifting gear and reporting to appropriate personnel.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Australian Standards, codes of practice and specifications
- lifting methods and lifting gear to suit various loads
- dogging signals and communication methods
- calculations relevant to lifting procedures
- lifting methods
- types and applications of load shifting equipment
- manufacturers' specifications
- enterprise and workplace communication procedures
- licensing and permit requirements
- site/non-site personnel.

Assessment Conditions

- Assessors must:

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  - have vocational competency in undertaking dogging at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11005 Pick and process order

Modification History

Release 1. Supersedes and is equivalent to MEM11005B Pick and process order

Application

This unit of competency defines the skills and knowledge required to receive an order, pick an order, check against documentation and place in the correct area and complete enterprise documentation.

This unit applies where the employee needs to exercise knowledge of the enterprise product range and the procedures, practices and standards for the storage and handling of a product.

Simple handling of goods not requiring the ability to identify different products or to interact with inventory records and stock location systems is covered by unit MEM11010 Operate mobile load shifting equipment or unit MEM11011 Undertake manual handling.

If materials handling equipment skills are required unit MEM11010 Operate mobile load shifting equipment should also be selected.

Where materials handling equipment requires a licence, appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the storage and handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Receive order**	2.1	Receive orders and check for errors
		2.2	Identify product to be picked
3	**Pick order**	3.1	Select and use materials handling equipment appropriate to products, as required
		3.2	Locate products to be picked according to SOPs
		3.3	Pick order, either by manual handling or using materials handling equipment
		3.4	Handle product according to storage and handling requirements identified in operating procedures/regulations

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Finalise order picking**	4.1 Check picked order against documentation
	4.2 Place picked order in correct area for consolidation
	4.3 Complete enterprise documentation

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials handling equipment includes one (1) or more of the following:	• forklift • order picker • WAVE truck • pallet trucks • wheelbarrow • trolleys • sack truck
Storage and handling requirements include the following:	• relevant legislative requirements e.g. dangerous goods and storage of poisons acts and regulations
Enterprise documentation includes one (1) or more of the following:	• invoices • orders • returns • recording cards • inventory documentation • maintenance inventories

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- documents (hardcopy or electronic) required by legislation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11005B Pick and process order

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11005 Pick and process order

Modification History

Release 1. Supersedes and is equivalent to MEM11005B Pick and process order

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices for picking and processing an order
- using appropriate material handling equipment in a warehouse
- picking/selecting products to fulfil order
- handling product in accordance with legislative requirements
- completing all enterprise documentation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- safe manual handling procedures
- reasons for selecting materials handling equipment
- safe storage and handling procedures for a range of products, including dangerous goods
- product identification systems
- Inventory and documentation requirements
- applicable safety data sheets (SDS).

Assessment Conditions

- Assessors must:
  - have vocational competency in picking and processing an order at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11006 Perform production packaging

Modification History

Release 1. Supersedes and is equivalent to MEM11006B Perform production packaging

Application

This unit of competency defines the skills and knowledge required to package and label finished goods, including assemblies, sub-assemblies, and individual or multiple components in a production/process environment for storage or transport.

It is not intended to apply in situations where simple interim packing, storage and/or stacking are undertaken in context of a production function.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the storage and handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Undertake packaging**	2.1	Identify packaging requirements from instructions or determined by safety, storage conditions, site and legislative requirements
		2.2	Undertake packaging according to SOPs
3	**Label packaged items**	3.1	Check to ensure identification labels, tags and stickers are correct and place/attach them in an appropriate manner
		3.2	Store packaged items in a safe, orderly and retrievable manner and record the location in the warehouse/store

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Packaging requirements include the following:

- packaging methods, including one (1) or more of the following:
  - manual processes
  - semi-automatic
  - fully automated packaging equipment
- procedures undertaken, including one (1) or more of the following:
  - standards
  - codes
  - legislative
  - company and customer requirements
- packaging material determined from instructions - written or verbal

Storage conditions, site and legislative requirements include the following:

- legislative requirements e.g. dangerous goods and storage of poisons acts and regulations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11006B Perform production packaging

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11006 Perform production packaging

Modification History

Release 1. Supersedes and is equivalent to MEM11006B Perform production packaging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices for performing production packaging
- determining packaging requirements and methods in accordance with requirements
- labelling packaging items according to SOPs
- handling and storing packaged items using scanning devices in accordance with legislative requirements
- completing all enterprise documentation according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- packaging requirements
- legislative requirements
- labelling procedures and standards
- storage and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing production packaging at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11007 Administer inventory procedures

Modification History

Release 1. Supersedes and is equivalent to MEM11007B Administer inventory procedures

Application

This unit of competency defines the skills and knowledge required for the administration of inventory procedures using manual or electric systems to support or maintain stores or inventory systems, for example, Just-in-Time or KANBAN systems.

Where routine activity within standard operating procedure (SOP) is undertaken unit MEM16006 Organise and communicate information and unit MEM16008 Interact with computing technology, should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Use inventory procedures**	2.1	Apply inventory procedures according to SOPs
		2.2	Use requisition, purchase, shipping and invoice documentation, as required
		2.3	Access inward/outward recording/filing system and maintain according SOPs
		2.4	Maintain customer orders
		2.5	Book back returned orders
3	**Requisition goods**	3.1	Apply requisition procedures
		3.2	Complete requisition of goods on time
		3.3	Complete all recording/s on system and file in an appropriate manner in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11007B Administer inventory procedures

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11007 Administer inventory procedures

Modification History

Release 1. Supersedes and is equivalent to MEM11007B Administer inventory procedures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting instructions on requisition, purchasing, shipping and invoice documentation, charts, lists and other applicable documents for administering inventory procedures
- accessing, organising, maintaining, recording and filing manual and electronic inventory information
- undertaking numerical operations and calculations to administer inventory procedures
- completing all enterprise documentation in accordance with SOPs

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- features and application of inventory systems, including Just-in-Time and KANBAN
- inventory procedures
- measurement techniques, tools and equipment for administering inventory procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in administering inventory procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11008 Package materials (stores and warehouse)

Modification History

Release 1. Supersedes and is equivalent to MEM11008B Package materials (stores and warehouse)

Application

This unit of competency defines the skills and knowledge required to determine package requirements, package and label items in a stores and warehousing environment, and includes stacking, storage, weight, size, material type and expected life and transport requirements.

Packaging includes sequenced packaging and point of pick up packaging, packaging materials and methods and often relates to receive and dispatch functions.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the storage and handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Determine packaging requirements**	2.1	Determine safety or special packaging requirements
		2.2	Determine storage requirements to meet safety, storage conditions, site and legislative requirements
		2.3	Determine transport and store requirements
3	**Undertake packaging and labelling of items**	3.1	Select and use the most appropriate packaging method to suit the product
		3.2	Use correct seal, compression and packaging materials
		3.3	Apply labels and identification stickers to accurately describe the content of package

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Site and legislative requirements include one (1) or more of the following:	• site requirements and SOPs • organisational policy • legislative requirements e.g. dangerous goods, storage of poisons, environmental protection acts and regulations
Transport and store requirements include one (1) or more of the following:	• racks • boxes • bins • road • rail • courier transport • dangerous goods code for transport of goods
Packaging methods and materials include one (1) or more of the following:	• wrapping • shrink wrapping • wrapping in bubble wrap • polystyrene packing, pallets • crates/boxes • other methods • packing tape • banding • boxes • pallet racking

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11008B Package materials (stores and warehouse)

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Assessment Requirements for MEM11008 Package materials (stores and warehouse)

Modification History

Release 1. Supersedes and is equivalent to MEM11008B Package materials (stores and warehouse)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- effectively communicating with the production and dispatch personnel
- selecting packaging methods and materials and following site procedures for labelling of packaged products
- determining storage requirements according to requirements
- determine transport and store requirements according to dangerous goods code for transport of goods
- undertaking numerical operations and calculations for packing goods
- completing all enterprise documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- packaging methods, materials and legislation
- weights, measures and capacities
- types of transport
- knowledge of organisational receive and dispatch functions
- applicable safety data sheets (SDS)
- labelling procedures and standards
- storage and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in packaging materials (stores and warehouse) at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11009 Handle/move bulk fluids/gases

Modification History

Release 1. Supersedes and is equivalent to MEM11009B Handle/move bulk fluids/gases

Application

This unit of competency defines the skills and knowledge required to determine the appropriate handling methods and storage of commercial fluids and gases greater than the quantities required by individuals to do their own jobs and applies to all containers used to store bulk fluids/gases.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the storage and handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Determine handling methods**	2.1	Determine type of material from labels, colour codes, signage
		2.2	Interpret and identify all relevant material properties or clarify with appropriately qualified and authorised authority
		2.3	Interpret and implement all relevant safety and emergency procedures, as required
		2.4	Interpret and observe all relevant legislation, regulations and codes of practice
		2.5	Undertake correct and appropriate handling methods
3	**Store bulk fluids/gases**	3.1	Determine correct storage conditions from instructions/manufacturers' specifications/directions
		3.2	Check containers for safe and clean use
		3.3	Fill/empty containers in accordance with procedures, regulations/legislative requirements
		3.4	Handle containers and move in accordance with site procedures, regulations/legislative requirements
		3.5	Label containers in a correct manner and store according to site procedures, regulations/legislative requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material properties include one (1) or more of the following:	• gas • solid • liquid Material properties are determined from safety data sheet, dangerous goods code, manifest or register
Safety and emergency procedures include the following:	• emergency procedures determined by organisational emergency response plan, and seeking advice from appropriately qualified and/or authorised personnel
Legislation, regulations and codes of practice include one (1) or more of the following:	• relevant jurisdictions WHS and dangerous goods acts and regulations • transport of dangerous goods code • industry codes of practice and standards
Storage conditions include the following:	• separation and segregation to legislative requirement and dangerous goods code

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11009B Handle/move bulk fluids/gases

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Assessment Requirements for MEM11009 Handle/move bulk fluids/gases

Modification History

Release 1. Supersedes and is equivalent to MEM11009B Handle/move bulk fluids/gases

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting handling and storage instructions, labels, colour codes, signage and terminology, regulations and industry codes of practice and standards
- communicating effectively with users of the materials and appropriately qualified and authorised authority
- calculating quantities and filling/emptying applicable containers, as required
- storing/handling bulk fluids and gases in accordance with storage conditions, including separation and segregation to legislative and dangerous goods code
- following safety and emergency procedures as determined by organisational emergency response plan and seeking advice from qualified or authorised personnel, as required
- completing all enterprise documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE) for various substances
- work health and safety (WHS) and dangerous goods acts and regulations, transport of dangerous goods code, industry codes of practice and standards, and relevant legislative requirements
- organisation's emergency response plan
- purpose and application of labels, colour codes and signage as applied to bulk fluids and gases
- safety data sheets
- procedures for filling and emptying storage containers
- packaging requirements for dangerous goods
- cleaning requirements for storage containers.

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Assessment Conditions

- Assessors must:
  - have vocational competency in handling/moving bulk fluids/gases at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11010 Operate mobile load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11010B Operate mobile load shifting equipment

Application

This unit of competency defines the skills and knowledge required to operate mobile load shifting equipment, including planning, moving and placing loads and shutting down and securing equipment after operation where knowledge of codes and signals is not required in workshops and/or on-site locations.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

Where the use of a forklift is required unit TLILIC2001 Licence to operate a forklift truck should also be selected.

Where the use of an order picking forklift is required unit TLILIC2002 Licence to operate an order picking forklift truck should also be selected.

Where the use of a vehicle loading crane with a capacity of 10 metre tonnes and above is required unit TLILIC0012 Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above) should also be selected.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare to shift loads**	2.1	Inspect work area to identify hazards, and implement appropriate prevention/control measures to avoid hazards
		2.2	Undertake routine pre-operational checks in accordance with manufacturers' specifications and regulatory safety requirements
		2.3	Inspect attachments and/or equipment
3	**Check controls and equipment**	3.1	Carry out pre-operational and post start-up equipment checks in accordance with manufacturers' specifications and/or operating manual
		3.2	Report defects and damage according to site procedures
4	**Shift and place loads**	4.1	Select the most appropriate load shifting device to suit load and shifting requirements
		4.2	Operate load shifting device within design specifications and safe working load in accordance with SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.3	Lift load, ensuring balance, vision of operation and protection of load
	4.4	Select and use the safe and efficient path of movement
	4.5	Check path of movement and monitor for obstacles and hazards
	4.6	Place loads ensuring safety, stability, protection of material and avoidance of hazards on-site
5 **Shut down equipment and secure site**	5.1	Park machinery in accordance with procedures, avoiding site and equipment hazards
	5.2	Conduct shutdown in accordance with manufacturers' specification to isolate vehicles
	5.3	Complete post-operational check in accordance with operational procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

On-site locations include one (1) or more of the following:	• factories • wharfs • ships • warehouses • manufacturing plants

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- building sites
- road construction
- demolition sites
- quarries and mine sites

Pre-operational checks include one (1) or more of the following:

- battery
- water
- fuel
- hazards warning lights
- fluid or gas leaks
- braking
- movement of booms
- visual checks of tyres
- emergency devise/alarms
- log books
- operating motions
- evidence of damage
- excessive wear and tear as determined by manufacturers' specifications and standard operating procedures

Attachments and/or equipment includes one (1) or more of the following:

- hooks
- electromagnetic hook
- buckets
- slings
- tag lines
- buckets
- trench
- excavating
- rock breakers
- shackles
- lifting lugs
- fork arms

Post start-up includes the following:

- hazards warning systems, attachments, movements and control functions are smooth
- operating and emergency controls and safety devices are located, identified and tested

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- communication signals are confirmed
- defects and damage are reported

Load shifting devices include one (1) or more of the following:

- front end loaders/back hoes
- ride on forklifts
- pallet trucks
- skid steer
- vehicle loading crane

Safe working load includes the following:

- assessing weight of load to ensure compliance with equipment load plate specifications

SOPs include one (1) or more of the following:

- industry standards
- production schedules
- safety data sheets (SDS)
- work notes and plans
- product labels
- manufacturers' specifications
- operator manuals
- enterprise policies and procedures
- supervisors' oral and written instructions
- current state/territory WHS legislation
- standards and codes of practice

Obstacles and hazards include one (1) or more of the following:

- overhead cables
- personnel, obstacles (fixed and moveable)
- trenches
- pits
- uneven terrain
- trees
- underground services
- exposure to chemicals
- dangerous or hazardous substances
- movements of equipment, goods and materials
- vehicular traffic

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Shutdown includes the following:

- post-operational equipment checks, motion locks and brakes are applied
- lifting equipment is checked
- defective equipment is identified, segregated and reported to supervisor
- equipment is correctly stowed

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11010B Operate mobile load shifting equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11010 Operate mobile load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11010B Operate mobile load shifting equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting tables, figures and instructions (both written and verbal) to work with others to operate mobile load shifting equipment
- performing routine safety, basic service and maintenance procedures as determined by manufacturers' specifications and site procedures
- calculating load masses and safe working loads and assessing calculation to ensure compliance with equipment load plate specifications
- selecting and safely operating appropriate load shifting equipment to shift loads, including interpreting communication signals and instructions
- conducting pre-operational checks, start-up and shutdown procedures
- determining load masses, including irregular shaped loads and equipment requirements
- demonstrating emergency operating procedures
- communicating faults, malfunctions and workplace hazards, reports and maintenance of operational records in accordance with site procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pre-operational checks
- start-up and shutdown procedures
- manufacturers' and design specifications of load shifting device
- load chart
- licensing requirements
- load protection and safe load placement
- operational environment
- relevant hazards

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- effect of load mass and shape on lifting and placing loads
- equipment load plate specifications
- appropriate permits
- workplace communication procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating mobile load shifting equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11011 Undertake manual handling

Modification History

Release 1. Supersedes and is equivalent to MEM11011B Undertake manual handling

Application

This unit of competency defines the skills and knowledge required to lift and move materials manually and/or using basic manual handling equipment in a wide range of environments.

Maximum manual lifting weight is limited to Safe Work Australia recommendations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Lift materials manually**	2.1	Determine material weight correctly utilising most appropriate technique, and assess risks associated with lifting
		2.2	Undertake lifting techniques to Safe Work Australia recommended procedures and having regard to types of movement, methods, storage, height and position
3	**Move/shift materials manually**	3.1	Select appropriate equipment, as required
		3.2	Place material safely and securely on moving equipment
		3.3	Relocate material ensuring safety of personnel and security of material
		3.4	Unload material and place in a safe and secure manner

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material weight includes	• determined using scales

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• interpreting signage
Lifting techniques include one (1) or more of the following:	• individual • team lifting • use of appropriate lifting equipment
Appropriate equipment includes one (1) or more of the following:	• hand trolleys • wheelbarrows • motorised/hand pallet trucks (not sit on) • hand carts • dedicated production or process lifting equipment • baskets, spreader bars, cradles or the like attached to lifting equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11011B Undertake manual handling

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11011 Undertake manual handling

Modification History

Release 1. Supersedes and is equivalent to MEM11011B Undertake manual handling

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing the risks associated with lifting materials manually and determining the most appropriate technique
- selecting and using the appropriate equipment to move/shift materials ensuring safety of personnel and security of material.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- manual handling techniques, including individual or team lifting
- appropriate equipment associated with move/shift materials
- hazards of incorrect procedures
- Safe Work Australia standards for manual handling.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking manual handling at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11012 Purchase materials

Modification History

Release 1. Supersedes and is equivalent to MEM11012B Purchase materials

Application

This unit of competency defines the skills and knowledge required to determine purchasing requirements, prepare purchase order/list and purchase materials.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job**	1.1 Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Determine purchasing requirements**	2.1	Consult with client, customer and/or user to determine purchasing requirements
		2.2	Determine material specifications from orders, instructions and/or technical drawings
		2.3	Determine quantities, price limitations and delivery requirements from orders, instructions
3	**Prepare purchase order/list and purchase materials**	3.1	Develop purchase order/list according to SOPs
		3.2	Inform supplier/vendor of requirements and specifications
		3.3	Adjust purchasing schedules, as required
		3.4	Exchange appropriate paperwork/contracts in accordance with SOPs
		3.5	Maintain records/files in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Purchasing includes one (1) or more of the following:	• one-off • multiple quantities of raw materials, components and equipment
Purchasing schedules include one (1) or more of the following:	• purchasing specifications - determined from standard engineering drawings, data sheets and/or instructions - written or verbal • purchasing schedules - developed to site procedures and for pre-contracted suppliers/vendors
Paperwork/contracts include one (1) or more of the following:	• generated manually • electronically utilising on-site system

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11012B Purchase materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11012 Purchase materials

Modification History

Release 1. Supersedes and is equivalent to MEM11012B Purchase materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting information on purchasing from specifications, data sheets, orders, records, files, technical drawings and purchasing schedules for purchasing requirements
- communicating with client, customer, user and supplier/vendor in identifying purchasing specifications and determining quantities, price and delivery requirements
- selecting the supplier and developing the purchase order in accordance with SOPs
- checking/clarifying and entering and maintaining information on manual and electronic workplace documents utilising an on-site system
- maintaining records/files in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- suppliers and available products
- purchasing procedures
- contract initiation and exchange procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in purchasing materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11013 Undertake warehouse receival process

Modification History

Release 1. Supersedes and is equivalent to MEM11013B Undertake warehouse receival process

Application

This unit of competency defines the skills and knowledge required to check supplier documentation, confirm the quality and quantity of received goods, arrange the unloading of goods and prepare, locate and store goods in a store or warehousing environment and utilise the application of the knowledge of warehouse systems and procedures.

Where the received goods are bulk fluids or gases (i.e. large commercial quantities) see unit MEM11009 Handle/move bulk fluids/gases.

Where load shifting equipment operation skills are required unit MEM11010 Operate mobile load shifting equipment should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where hazardous goods are received and handled unit MEM13003 Work safely with industrial chemicals and materials should also be selected.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **4**

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Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Check supplier documentation against order according to SOPs
2	**Confirm the quality and quantity of received goods**	2.1	Check the quality and quantity of goods against order and supplier documentation
		2.2	Identify incorrect and damaged goods and take appropriate action according to SOPs
3	**Arrange unloading of goods**	3.1	Identify goods requiring special unloading procedures
		3.2	Unload goods using manual handling or appropriate lifting equipment
		3.3	Sign or process carrier or supplier documentation according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Prepare, locate and store received goods**	4.1 Prepare goods for storage and apply appropriate signs, codes or labels
	4.2 Complete inventory records documentation
	4.3 Identify correct storage location and store goods using appropriate materials handling techniques

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Documentation includes one (1) or more of the following:	• invoice • carrier or supplier documentation • purchase specifications
Special unloading procedures include the following:	• special unloading procedures required in respect of hazardous goods, chemicals/poisons and goods where size, shape and fragility require special procedures
Lifting equipment includes one (1) or more of the following:	• hand trolleys • wheelbarrows • motorised/hand pallet trucks (not sit on) • hand carts • dedicated production or process lifting equipment • baskets, spreader bars, cradles or the like attached to lifting

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

equipment

Codes include one (1) or more of the following:

- dangerous goods acts and regulations
- storage of chemicals/poisons
- industry codes of practice
- environmental codes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11013B Undertake warehouse receival process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11013 Undertake warehouse receival process

Modification History

Release 1. Supersedes and is equivalent to MEM11013B Undertake warehouse receival process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting signs, codes, labels and other applicable documentation for undertaking warehouse receival process
- checking orders, quantities, descriptions and supplier documentation against order
- identifying goods requiring special unloading procedures
- using manual handling or lifting equipment to unload goods
- selecting storage procedures and processes and labelling accordingly
- completing inventory documentation onto manual and electronic workplace documents.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- relevant legislation, regulations and codes
- checking and recording processes and procedures
- handling of hazardous goods
- storage procedures and processes, including labelling.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking warehouse receival process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11014 Undertake warehouse dispatch process

Modification History

Release 1. Supersedes and is equivalent to MEM11014B Undertake warehouse dispatch process

Application

This unit of competency defines the skills and knowledge required to arrange and consolidate orders, prepare and dispatch goods in a store or warehousing environment and utilise the application of the knowledge of warehouse systems and procedures.

Where the received goods are bulk fluids or gases (i.e. large commercial quantities) unit MEM11009 Handle/move bulk fluids/gases should also be selected.

Where load shifting equipment operation skills are required unit MEM11010 Operate mobile load shifting equipment should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where hazardous goods are received and handled unit MEM13003 Work safely with industrial chemicals and materials should also be selected.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Where the handling of dangerous goods is a component of the application of this unit, users should check for relevant regulations and legislation with the appropriate authorities.

Band: **A**

Unit Weight: **4**

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Pre-requisite Unit

MEM11008	Package materials (stores and warehouse)
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify despatch requirements from customer requirements
2	**Arrange and consolidate orders**	2.1	Consolidate packed orders into customer or carrier batches according to SOPs
		2.2	Place consolidated goods into correct dispatch area
3	**Prepare for dispatch of goods**	3.1	Identify goods requiring special unloading procedures
		3.2	Pack goods and shrink-wrap and/or palletise
		3.3	Label goods and attach appropriate documentation according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.4	Place goods in dispatch area ready for loading according to pick-up schedule and carrier requirements
4 **Dispatch goods**	4.1	Check carrier and customer documentation
	4.2	Communicate loading and transportation requirements to driver and receive confirmation from the driver
	4.3	Load goods onto vehicle using appropriate materials handling techniques and devices
	4.4	Complete inventory records/documentation according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Packed includes one (1) or more of the following:

- wrapping
- shrink wrapping
- wrapping in bubble wrap
- polystyrene packing
- pallets
- crates/boxes
- other methods
- packing tape
- banding
- boxes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	• pallet racking
Labelled includes the following:	• labelling to meet requirements of dangerous goods legislation acts and regulations, storage of chemicals/poisons, industry codes of practice and environmental codes
Documentation includes one (1) or more of the following:	• invoice • carrier or supplier documentation
Loading includes the following:	• special loading procedures required with respect to hazardous goods, chemicals/poisons and for goods where size, shape, fragility require special procedures
Materials handling techniques and devices include one (1) or more of the following:	• hand trolleys • wheelbarrows • motorised/hand pallet trucks (not sit on) • hand carts • dedicated production or process lifting equipment • baskets, spreader bars, cradles or the like attached to lifting equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11014B Undertake warehouse dispatch process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11014 Undertake warehouse dispatch process

Modification History

Release 1. Supersedes and is equivalent to MEM11014B Undertake warehouse dispatch process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting signs, codes, labels and other applicable documentation for undertaking warehouse dispatch process
- checking orders, quantities, descriptions and supplier documentation against order
- packing goods ready for dispatch and label to meet dangerous goods legislation acts and regulations, storage of chemicals/poisons, industry codes of practice and environmental codes as required
- identifying goods requiring special loading procedures
- using manual handling or lifting equipment to load goods
- completing inventory documentation onto manual and electronic workplace documents.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- relevant legislation, regulations and codes
- checking and recording processes and procedures
- handling of hazardous goods, storage procedures and processes, including labelling.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking warehouse dispatch process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11015 Manage warehouse inventory system

Modification History

Release 1. Supersedes and is equivalent to MEM11015B Manage warehouse inventory system

Application

This unit of competency defines the skills and knowledge required to monitor warehouse record keeping processes, including computer based or manual, supervise the production of inventory system reports and analyse inventory reports and applies to the supervision of a warehouse inventory system used by other warehouse, production and maintenance or management personnel.

Where skills to maintain/supervise application of quality procedures are required unit MEM15012 Maintain/supervise the application of quality procedures should also be selected.

Where computer-based records are used appropriate computer units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11007	Administer inventory procedures
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Monitor warehouse record keeping processes**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Develop monitoring procedures for requisition, purchase, shipping and invoice documentation
		1.4	Establish discrepancy reporting procedures for warehouse and other personnel in accordance with SOPs
		1.5	Follow audit and archive procedures
2	**Supervise production of inventory system reports**	2.1	Prepare regular inventory reports in accordance with SOPs
		2.2	Prepare special stock level and other inventory reports, as required
		2.3	Make adjustments to inventory reporting procedures to meet internal and external customer requirements
3	**Analyse inventory reports**	3.1	Undertake reconciliation of inventory records against production or purchase of sales records in accordance with SOPs
		3.2	Identify major trends not requiring sophisticated statistical analysis
		3.3	Interpret inventory system relationship to the manufacturing process

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Monitoring procedures include one (1) or more of the following:	• loss control • inventory system (paper based or electronic) • maximum/minimum limits • rotation
Discrepancy includes one (1) or more of the following:	• inventory numbers • quantity • products • price • damaged goods • delivery date
Inventory system includes one (1) or more of the following:	• Just-in-Time (JIT) • KANBAN • MRP2

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11015B Manage warehouse inventory system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11015 Manage warehouse inventory system

Modification History

Release 1. Supersedes and is equivalent to MEM11015B Manage warehouse inventory system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting information on requisition, purchase, sales, shipping and invoice documentation, inventory records, discrepancy reports, list and other applicable reference documents for managing warehouse inventory system
- developing monitoring procedures for an inventory system to monitor loss control, maximum/minimum limits and rotation of stock
- establishing discrepancy reporting procedures
- undertaking numerical operations and calculations associated with managing a warehouse inventory system
- accessing/managing manual and electronic information, including communicating with staff about the system/s used in the enterprise and monitoring all warehouse documentation
- preparing reports, including inventory, special stock level, reconciling and other reports, as required, and identifying major trends in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- inventory systems, for example, Just-in-Time (JIT), KANBAN and MRP2
- quality procedures
- monitoring and discrepancy processes and procedures
- warehouse organisation principles
- storage of hazardous materials
- auditing procedures
- relationship of manufacturing system to inventory process
- techniques for developing inventory monitoring and discrepancy procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in managing warehouse inventory system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11016 Order materials

Modification History

Release 1. Supersedes and is equivalent to MEM11016B Order materials

Application

This unit of competency defines the skills and knowledge required to prepare a purchase/order list and place the order. It applies to purchasing activities carried out by a person other than the purchasing officer, including maintenance, service, stores and warehouse personnel. Approval to order limits and delegations will be included in the standard operating procedures (SOPs) or purchasing policy.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare purchase order/list**	2.1	Prepare purchase order/list according to SOPs
		2.2	Determine material specifications, price limitations, quantities and delivery requirements from instructions and requisitions
3	**Purchase order**	3.1	Inform supplier/vendor of requirements and specifications
		3.2	Follow up supplier/vendor to achieve delivery, as required
		3.3	Receive goods and check for damage, where appropriate
		3.4	Complete records/files according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Material specifications include one (1) or more of the following:

- manufacturers' catalogues
- from the item
- from a drawing

Suppliers/vendors include one (1) or more of the following:

- local
- national
- international
- preferred supplier

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11016B Order materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11016 Order materials

Modification History

Release 1. Supersedes and is equivalent to MEM11016B Order materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting material specifications, requisitions, lists, records, files and other applicable reference documents for ordering materials
- preparing a purchase order/list, checking and clarifying information and entering information onto manual and electronic proformas and standard workplace forms
- communicating effectively with supplier/vendor and other personnel
- checking received goods for conformance to specifications
- completing all records/files in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- ordering policy (delegations and preferred suppliers)
- ordering procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in ordering materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11017 Organise and lead stocktakes

Modification History

Release 1. Supersedes and is equivalent to MEM11017B Organise and lead stocktakes

Application

This unit of competency defines the skills and knowledge required to organise and lead periodical stocktakes, including planning a stocktake, briefing team members, generating stocktake reports and adjusting inventory documentation.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11007	Administer inventory procedures
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			requirements at all times
		1.3	Identify stocktake requirements from enterprise stocktaking policies, practices and procedures
2	**Plan stocktake and brief participants**	2.1	Prepare and distribute inventory lists
		2.2	Allocate warehouse and/or production areas to each individual or team assisting in stocktake
		2.3	Provide clear directions and appropriate documentation and equipment to each individual or team participating in stocktake
3	**Generate stocktake reports**	3.1	Collect written or computer reports from individuals or teams on stock counts
		3.2	Confirm inventory data to match stock levels
		3.3	Prepare and distribute stock discrepancy report according to SOPs
4	**Adjust inventory documentation**	4.1	Reconcile inventory documentation to match physical stock in accordance with SOPs
		4.2	Reconcile stocktake information with audit requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Directions include one (1) or more of the following:	• oral or written instructions • methodology • how to report discrepancies or damaged stock • timelines
Equipment includes one (1) or more of the following:	• calculators • scanners • portable computers
Inventory documentation includes one (1) or more of the following:	• reports on actual stock • damaged stock • out-of-date stock • discrepancies

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11017B Organise and lead stocktakes

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11017 Organise and lead stocktakes

Modification History

Release 1. Supersedes and is equivalent to MEM11017B Organise and lead stocktakes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing inventory lists and instructions on procedures to be followed
- providing directions to personnel undertaking stocktaking and equipment to carry out the stocktake
- undertaking numerical operations and calculations associated with organising and leading stocktakes
- analysing and reporting results of stocktakes by manual and electronic means
- reconciling inventory documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices
- relevant inventory systems and procedures
- recording systems and procedures
- analysis and reporting methods/procedures
- audit processes.

Assessment Conditions

- Assessors must:
  - have vocational competency in organising and leading stocktakes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11018 Organise and maintain warehouse stock receival and dispatch system

Modification History

Release 1. Supersedes and is equivalent to MEM11018B Organise and maintain warehouse stock receival and/or despatch system

Application

This unit of competency defines the skills and knowledge required to organise, configure and maintain warehouse receival and dispatch areas taking into account customer and supplier needs, including special requirements of products, materials and location, documentation and system requirements.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11008	Package materials (stores and warehouse)
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Plus, one or more of the following, including their prerequisites:

MEM11013	Undertake warehouse receival process
MEM11014	Undertake warehouse dispatch process

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify warehouse receival and dispatch areas organisational requirements from enterprise quality practices and procedures
2	**Allocate/coordinate work activities in receival and dispatch areas**	2.1	Allocate equipment and/or staff to meet receival and dispatch schedules
		2.2	Distribute and collect relevant documentation
		2.3	Develop contingency procedures and implement for receival and dispatch problems
3	**Maintain stock receival and dispatch system**	3.1	Provide information and extract in an accurate manner according to SOPs
		3.2	Produce receival and dispatch reports, as required
		3.3	Make modifications to dispatch and receival system according to SOPs
		3.4	Identify and report problems with receival and dispatch system
		3.5	Participate in continuous improvement of dispatch and receival systems

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• calculators • scanners • portable computers
Staff includes one (1) or more of the following:	• drivers • stores assistants • casuals • specialists
Modifications include one (1) or more of the following:	• extra staff • adjustment of hours • set up special storage areas • hire of lifting equipment
Problems include one (1) or more of the following:	• out-of-hours receival • late deliveries or dispatches • dealing with goods that need equipment for loading or unloading • hazardous goods • inadequate stores capacity • emergency procedures • special legislative requirements

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11018B Organise and maintain warehouse stock receival and/or despatch system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11018 Organise and maintain warehouse stock receival and dispatch system

Modification History

Release 1. Supersedes and is equivalent to MEM11018B Organise and maintain warehouse stock receival and/or despatch system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- coordinating staff and equipment for receival and dispatch
- developing and implementing contingency procedures in solving warehouse problems
- producing stock receival and dispatch reports in accordance with SOPs
- making modifications to dispatch and receival system, as required
- participating in continuous improvement of the warehouse dispatch and receival system.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- receival and dispatch systems
- relevant legislation, regulations and codes of practice
- inventory systems and procedures
- auditing processes
- quality systems
- warehousing systems
- continuous improvement processes and procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in organising and maintaining warehouse stock receival and dispatch system at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11019 Undertake tool store procedures

Modification History

Release 1. Supersedes and is equivalent to MEM11019B Undertake tool store procedures

Application

This unit of competency defines the skills and knowledge required to order, receive, maintain and distribute permanent or disposable tooling and specialist tools and associated consumable items used in engineering applications and environments from a specialist store or warehouse.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11007	Administer inventory procedures
MEM11011	Undertake manual handling
MEM11013	Undertake warehouse receival process
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify tools/tooling requirements and consolidate from order documentation and liaise with trade and production personnel according to SOPs
2	**Order and receive tools/tooling**	2.1	Identify appropriate tools/tooling from supplier catalogues and manuals, including correct size, hardness and quality
		2.2	Place order according SOPs
		2.3	Receive orders from main receival warehouse or direct from supplier
		2.4	Unpack orders and place stock in correct location
		2.5	Check items and confirm against order
		2.6	Process incorrect items according to SOPs
3	**Maintain and distribute tools/tooling**	3.1	Clean tools/tooling and protect, as required
		3.2	Monitor supplies to ensure maintenance of contingency stock
		3.3	Issue tools/tooling to users according to SOPs
		3.4	Follow enterprise documentation procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Establish and follow procedures against unauthorised use of tools/tooling

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engineering applications and environments include one (1) or more of the following:	• production manufacturing • specialist machining • maintenance settings • fabrication workshops
Tools/tooling include one (1) or more of the following:	• hand tools • cutting tips for lathes, mills and other machines for metal removal • grinding wheels • special steel • engineering power tools • specialised hand tools • mechanical and electro-mechanical devices (e.g. for lifting and clamping) • measuring and marking equipment • templates • jigs

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11019B Undertake tool store procedures

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11019 Undertake tool store procedures

Modification History

Release 1. Supersedes and is equivalent to MEM11019B Undertake tool store procedures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, data sheets, supplier catalogues and manuals for relevant tools/tooling information
- undertaking stock control and ordering tools/tooling as required
- performing manual handling and packing and storing engineering specialist tools/tooling
- cleaning and maintaining engineering tools/tooling and protecting in accordance with manufacturers' specifications and procedures, as required
- distributing tools/tooling and completing enterprise documentation in accordance with SOPs, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types and applications of engineering tooling and specialist engineering tools
- methods of storing and protecting tools/tooling
- ordering procedures
- inventory systems
- procedures for protecting store against unauthorised entry and use of tools/tooling.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking tool store procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM11020 Perform advanced warehouse computer operations

Modification History

Release 1. Supersedes and is equivalent to MEM11020B Perform advanced warehouse computer operations

Application

This unit of competency defines the skills and knowledge required to identify programs appropriate to the purpose, manipulate data for analysis and/or report generation and edit the program, as required, and applies to advanced operations on warehouse computer information systems.

This unit identifies the level of computer skills needed rather than the inventory system or product knowledge required.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify the range of programs available on the system
		1.4	Make appropriate selection of program/s to suit requirements
2	**Manipulate data for analysis and/or report generation**	2.1	Manipulate data through merging of files, transfer of information between programs or other strategies to generate desired outcome
3	**Edit program**	3.1	Create/delete categories in warehouse information system to cater for changes in stock lines
		3.2	Generate and/or modify report formats
		3.3	Identify access control requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Programs include one (1) or more of the following:	• word processing • spreadsheet

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- database
- special purpose programs

Data includes one (1) or more of the following:

- suppliers
- pricing
- stock in hand
- shortages
- invoicing
- ordering
- budget
- reporting

Categories include one (1) or more of the following:

- stock control
- customers
- suppliers
- address/contact details
- billing
- debtor information

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11020B Perform advanced warehouse computer operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11020 Perform advanced warehouse computer operations

Modification History

Release 1. Supersedes and is equivalent to MEM11020B Perform advanced warehouse computer operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and accessing program/s appropriate to the task
- performing data input and manipulating and editing programs
- creating/deleting categories to cater for changes in stock lines
- generating and modifying reports and producing accurate records related to warehouse operations in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- application, features/functions and operation of relevant computer programs
- stock control systems
- recording requirements of enterprise
- access control requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced warehouse computer operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM11021 Perform advanced operation of load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11021B Perform advanced operation of load shifting equipment

Application

This unit of competency defines the skills and knowledge required to determine lift and load requirements, work within areas of restricted movement or conditions of restricted visibility, identify loads that need special care, and operate forklifts in special traffic conditions.

This unit applies to advanced forklift and load shifting skills above those required for general operation and is intended to cover load shifting applications where special-purpose equipment/accessories requiring advanced operational skills are required.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11010	Operate mobile load shifting equipment
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify load and check against safe working load and/or relevant specifications or regulations and final position/location
		1.5	Identify special handling requirements of load, if applicable
		1.6	Lift and place load in the correct final position/location to achieve specified balance of load
2	**Identify and carry loads that require special care**	2.1	Identify loads requiring special care
		2.2	Carry loads in accordance with special requirements of product according to procedures and/or regulations
3	**Operate forklifts in areas of restricted movement and in special traffic conditions**	3.1	Collect and manoeuvre load without damage to load or collision with obstacles according to SOPs
		3.2	Operate forklifts in areas of heavy traffic
		3.3	Operate forklifts over difficult or uneven surfaces
		3.4	Operate forklifts in areas shared with the general public, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Safe working load includes the following:	• as defined in the manufacturers' specifications for lifting plant or gear
Loads requiring special care include one (1) or more of the following:	• non-standard load configuration • fragile loads • dangerous (volatile, explosive and sensitive) • raising and lowering personnel on approved work platforms (forklift only)
Advanced operational skills include one (1) or more of the following:	• heavy loads • out-of-balance loads • awkward and irregular shaped loads • traversing over rough, broken or uneven surfaces • high lift situations • extremes of climate

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11021B Perform advanced operation of load shifting equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11021 Perform advanced operation of load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11021B Perform advanced operation of load shifting equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, regulations, load charts and communicating with personnel on movement/location when performing advanced operation of load shifting equipment
- selecting appropriate load shifting device to suit shifting requirements
- identifying safe working loads as defined in the manufacturers' specifications for lifting plant or gear
- identifying/managing loads requiring special care and taking appropriate action
- operating forklifts in a complex mobile plant environment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pre-operational checks
- licensing requirements and appropriate permits
- load protection
- operational environment
- methods and techniques for loads requiring special care.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced operation of load shifting equipment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11022 Operate fixed/moveable load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11022B Operate fixed/movable load shifting equipment

Application

This unit of competency defines the skills and knowledge required to conduct routine operation and safety checks of fixed/moveable load shifting equipment within the limits of manufacturers' recommended procedures.

It covers safe working loads, picking up loads, shifting and placing loads and activities where knowledge of codes and signals is not required.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

Depending on the equipment being used a high risk work licence may be required and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from job sheets or work instructions
2	**Conduct routine operation and safety checks of load shifting equipment**	2.1	Interpret operational principles of fixed/moveable load shifting equipment
		2.2	Undertake routine pre-operational checks in accordance with manufacturers' specifications and regulatory safety requirements
		2.3	Report non-compliance with specifications according to SOPs
3	**Pick up loads**	3.1	Select appropriate load shifting device for the load and shifting requirements
		3.2	Operate load shifting device within design specifications and safe working load
		3.3	Lift/roll load, ensuring balance, vision of operation, safety of personnel and protection of load
4	**Shift and place loads**	4.1	Move load at an appropriate and safe speed using a safe and efficient path
		4.2	Monitor path of movement for obstacles and hazards during shifting process
		4.3	Lower loads at an appropriate and safe rate
		4.4	Place loads to ensure stability, protection of material and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

avoidance of hazards on site

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fixed/moveable load shifting equipment includes one (1) or more of the following:	• pendant cranes • yard, workshop and travelling overhead cranes • monorail hoists and chain blocks • pivoting and slewing jibs rails (manual, air or electric)
Pre-operational checks include one (1) or more of the following:	• hazards warning lights • wire rope • lifting blocks • compass • operation of controls • safe working load marked as determined by manufacturers' specifications and SOPs
Obstacles and hazards include one (1) or more of the following:	• overhead cables • electrical hazards (live rails) • personnel • obstacles (fixed and moveable) • swing of the load • failure of slings

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11022B Operate fixed/movable load shifting equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11022 Operate fixed/moveable load shifting equipment

Modification History

Release 1. Supersedes and is equivalent to MEM11022B Operate fixed/movable load shifting equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, regulations, load charts and communicating with personnel on movement/location when operating fixed/movable load shifting equipment
- selecting load shifting device appropriate to the task being performed
- conducting pre-operational checks in accordance with manufacturers' specifications and SOPs
- identifying the safe working load marked as determined by manufacturers' specifications and SOPs in relation to the capacity of the load shifting equipment
- lifting and moving loads in a safe manner being aware of obstacles and hazards
- placing loads ensuring stability, protection of materials and avoidance of hazards.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operational principles of fixed/moveable load shifting equipment
- pre-operational checks
- loads and lifting attachments
- load chart and safe working loads (SWL)
- licensing requirements
- load protection
- operational environment
- appropriate permits.

Assessment Conditions

- Assessors must:

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  - have vocational competency in operating fixed/movable load shifting equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11023 Operate a bridge and gantry crane

Modification History

Release 1. Supersedes and is equivalent to MEM11023A Operate a bridge and gantry crane

Application

This unit of competency defines the skills and knowledge required for the operation of bridge and gantry cranes that are operated from a permanent cabin/control station on the crane in a manufacturing related environment, including a factory, raw material or finished goods store.

While this unit applies to work covered by licensing requirements, it also includes other manufacturing related skills, including integrating crane operations with production, jobbing, maintenance or warehouse operations.

This unit does not cover the bridge and gantry crane types that are controlled from a location remote to a permanent cabin/control station on the crane and that have three or less powered operations, i.e. hoist/raise and lower in one operation and also does not cover the slinging or rigging of loads.

This unit is not recognised by regulators for licensing requirements. In order to satisfy licensing requirements, the imported unit TLILIC3003 Licence to operate a bridge and gantry crane will be required.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

Band A

Unit Weight 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Obtain load transfer authorisation, including lift time and load destination
2	**Plan work**	2.1	Identify potential hazards for load lift and transfer
		2.2	Identify hazard control measures consistent with appropriate standards to ensure the safety of personnel and equipment
		2.3	Estimate weight (mass) of the load in consultation with associated personnel
		2.4	Determine appropriate paths for the movement of loads in the work area
		2.5	Check crane capacity to the load, as appropriate
		2.6	Identify appropriate communication methods with associated personnel
3	**Conduct routine checks**	3.1	Apply appropriate hazard prevention/control measures to the work area according to procedures
		3.2	Access crane in a safe manner
		3.3	Check crane visually for any damage or defects
		3.4	Ensure all signage and labels are visible and legible

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		according to the appropriate standard
	3.5	Carry out routine pre-operational crane checks according to SOPs
	3.6	Locate and identify all controls
	3.7	Check crane service logbook for compliance
	3.8	Start crane and check for any abnormalities according to SOPs
	3.9	Test crane safety devices according to SOPs
	3.10	Carry out post-start operational checks according to SOPs
	3.11	Check all communication equipment for serviceability
	3.12	Report all damage and defects and record according to SOPs, and take appropriate action
4 **Transfer loads**	4.1	Position hoist block over load following directions from associated personnel
	4.2	Carry out test lift according to SOPs
	4.3	Transfer loads along planned path
	4.4	Ensure all crane movements are according to SOPs and the appropriate standard
	4.5	Interpret communication signals according to SOPs and the appropriate standard
	4.6	Operate crane according to SOPs
	4.7	Monitor load movements constantly ensuring safety to personnel and load, and structural stability
	4.8	Respond to unplanned and/or unsafe situations in accordance with SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Shut down and secure crane**	5.1 Park crane according to SOPs
	5.2 Stow crane and equipment and secure according to SOPs and the appropriate standard
	5.3 Apply all relevant motion locks and brakes, as applicable
	5.4 Shut down crane according to SOPs
	5.5 Carry out routine post-operational crane checks according to SOPs
	5.6 Remove hazard prevention/control measures, where applicable
	5.7 Report all damage and defects and record according to SOPs, and take appropriate action

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:

- ground stability (e.g. ground condition or slopes for load placement)
- overhead hazards (e.g. powerlines and service pipes)
- insufficient lighting
- traffic (e.g. pedestrians, vehicles and plant)
- environmental conditions (e.g. dust, wind, lightning and storms)
- other specific hazards (e.g. dangerous materials)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazard control measures include the following:

- the systematic process of eliminating or reducing the risk to personnel and property through the application of controls consistent with appropriate standards
- the application of the hierarchy of control, the six-step preference of control measures to manage and control risk:
  1. elimination
  2. substitution
  3. isolation
  4. engineering control measures
  5. using safe work practices
  6. personal protective equipment (PPE)

Appropriate standards include one (1) or more of the following:

- codes of practice and legislation
- Australian Standards
- crane manufacturer specifications
- industry and workplace standards, as applicable

Appropriate paths include one (1) or more of the following:

- ensure clearances of fixed machinery, equipment, fixtures and work in progress
- minimise transfers across workstations and walkways
- minimise disruption to work unrelated to the load transfer
- minimise transfer time and distance subject to safety and disruption assessments

Associated personnel include the following:

- riggers and doggers
- supervisory and expert personnel to advise on any special features of the load or transfer

Cranes are operated from a permanent cabin/control station on the crane and include one (1) or more of the following:

- bridge crane, a bridge beam mounted at each end to an end carriage, capable of travelling along elevated runways and having one or more hoisting mechanisms arranged to traverse across the bridge
- gantry crane, a bridge beam, supported at each end by legs mounted on end carriages, capable of travelling on supported surfaces or deck levels, whether fixed or not and which has a crab with one or more hoisting units arranged to travel across

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	the bridge
Communication methods include one (1) or more of the following:	• verbal and non-verbal language • written instructions • signage • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol
Signage and labels include one (1) or more of the following:	• crane data plates/labels • load charts • crane decals • control labels
Procedures include one (1) or more of the following:	• manufacturer guidelines (instructions, specifications or checklists) • industry operating procedures • workplace procedures (work instructions, operating procedures and checklists)
Controls include one (1) or more of the following:	• long travel levers • cross travel levers • hoisting and lowering levers • rotating hook levers, where applicable
Service logbook includes one (1) or more of the following:	• service book and any logbook • history record system where the service and maintenance history is kept
Safety devices include the following:	• horns/sirens and lights • audible and visual motion devices • operator restraint devices, where applicable

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication equipment includes one (1) or more of the following:	• two-way radios • whistles • bells and buzzers
Hazard prevention/control measures include one (1) or more of the following:	• safety tags on electrical switches/isolators • insulated powerlines • safety observer used inside exclusion zone • disconnected power • traffic barricades and controls • pedestrian controls • movement of obstructions • PPE • adequate illumination

Test lift includes the following:	• lifting the load just clear of the lifting plane to allow for checks to be safely made in consultation with associated personnel to ensure that:
	  • near capacity loads do not overload the crane
	  • loads of unusual shape or weight distribution are correctly slung
	  • load measuring equipment can be used to verify the calculated weight of the load
	  • all crane equipment is functioning properly
	  • adjustments to the slinging can be made in a safe manner

Relevant crane movements include the following:	• hoisting (raise and lower) • traversing (moving hoisting mechanisms along bridge) • travelling (at minimum speed, gentle acceleration and braking, to minimise load swing)
Communication signals include the following:	• stop – hand and whistle • hoist up – hand and whistle • hoist down – hand and whistle • traverse - hand • travel - hand • creep - hand

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unplanned and/or unsafe situations include the following:	• failure/loss of control (e.g. brakes and steering) • failure of equipment (e.g. hydraulic system) • environmental conditions (e.g. wind, lightning and storms)
Shutdown includes the following:	• retracting hoist rope and hook block • travelling crane to park position • removing key from control panel, as applicable • locking and securing cabin, as applicable • isolating power to crane

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11023A Operate a bridge and gantry crane

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11023 Operate a bridge and gantry crane

Modification History

Release 1. Supersedes and is equivalent to MEM11023A Operate a bridge and gantry crane

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting safety signs, manufacturers' specifications and data, including maximum load information to ensure crane is not overloaded
- complying with work health and safety (WHS) licensing legislation
- communicating and working safely with others in the work area, including the use of hand signals, whistles and two-way radios
- applying risk assessment and management procedures (particular awareness of the risks associated with overhead powerlines/electrical cables, access to cabin, other personnel and equipment in the work area, including vehicles and clear access whilst travelling)
- conducting pre- and post-operational checks of the bridge and gantry crane
- planning load transfer path for safety and efficiency in a manufacturing related environment
- operating a bridge and gantry crane, including all functions to their maximum capacity in the lifting and moving of loads to the maximum rated capacity, in conjunction with other associated personnel
- applying appropriate mathematical procedures for estimation of loads.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate mathematical procedures for estimation of loads
- bridge and gantry crane characteristics
- federal, state or territory WHS legislation, standards and codes of practice relevant to the full range of processes for the crane class
- emergency procedures, including escape routes
- hierarchy of hazard identification and control
- organisational and workplace standards, requirements, policies and procedures for conducting operations for the crane class

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- typical hazards in manufacturing related environments, including:
  - process areas that must be avoided, ceased or special procedures adopted before load transfers occur, including welding, machining, melting and casting
  - transfers across areas frequented by personnel, including workstations and walkways
  - hazardous loads, including hot or liquid metals, chemicals, heavy and non-standard shaped loads
- procedures for the recording, reporting and maintenance of workplace records and information
- typical routine problems encountered in the operation of the crane and equipment and adjustments required for correction.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating a bridge and gantry crane at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11024 Undertake basic rigging

Modification History

Release 1. Supersedes and is equivalent to MEM11024A Undertake basic rigging

Application

This unit of competency defines the skills and knowledge required to undertake basic rigging in a manufacturing or related enterprise and includes rigging work associated with movement of plant and equipment and temporary or permanent steel structures, including: platforms, access ways and ladders, hoppers and bins, and conveyors. This work will often be required to be undertaken with other employees especially tradespersons, bridge and gantry and mobile crane drivers, and doggers.

While this unit applies to work covered by licensing requirements, it also includes other manufacturing related skills, including integrating rigging with welding, fabrication, production, jobbing, maintenance or warehouse operations.

This unit is not recognised by regulators for licensing requirements. In order to satisfy licensing requirements, the imported unit CPCCLRG3001A Licence to perform rigging basic level will be required.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where erection, alteration or dismantling of scaffolding is required to be undertaken unit MEM11001 Erect/dismantle scaffolding and equipment and unit MEM11002 Erect/dismantle intermediate scaffolding and equipment, should also be selected as appropriate.

This unit does not cover the slinging of loads which is covered in unit MEM11004 Undertake dogging, or the skills associated with fabrication and welding of metal structures or components.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

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Band A

Unit Weight 4

Pre-requisite Unit

MEM11004	Undertake dogging
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify rigging to be undertaken and assess from supervisor’s instructions and other appropriate sources
2	**Assess rigging site**	2.1	Identify equipment and processes in close proximity to rigging site and the need for protection, shielding or closure during rigging with appropriate personnel
		2.2	Identify other potential workplace hazards and appropriate hazard control measures
		2.3	Obtain site information
		2.4	Identify rigging equipment and associated equipment,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			including safety equipment available on site
3	**Plan rigging work**	3.1	Consider all forces and loads associated with erecting and dismantling structures and associated equipment in consultation with appropriate personnel
		3.2	Identify required safety equipment for rigging task
		3.3	Consider procedures for minimising disruption to other site processes
		3.4	Identify appropriate communication methods with appropriate personnel
4	**Select and inspect equipment**	4.1	Select rigging equipment and associated equipment and inspect according to SOPs and the appropriate standard
		4.2	Select required safety equipment and inspect according to SOPs
		4.3	Isolate all defective rigging equipment, associated equipment and safety equipment and report and record according to SOPs
		4.4	Select, as applicable, communication equipment and inspect for serviceability
5	**Set up rigging task**	5.1	Apply appropriate hazard prevention or control measures to the work area according to SOPs
		5.2	Inspect ground suitability and check, where appropriate
		5.3	Review site information and interpret with appropriate personnel
		5.4	Determine all forces and loads associated with erecting and dismantling structures and associated plant and compare with planned forces and loads in consultation with appropriate personnel
		5.5	Make required adjustments for actual forces and loads to

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			rigging plan, rigging equipment, associated equipment and safety equipment
		5.6	Position rigging equipment and associated plant for work application and stability according to SOPs
		5.7	Apply methods of applying temporary connections using fibre rope according to SOPs and the appropriate standard
6	**Erect, move or dismantle structures, plant or equipment**	6.1	Erect structures, plant or equipment, move or dismantle according to SOPs and site information
		6.2	Maintain stability of structures, plant or equipment during erection, movement or dismantling
		6.3	Follow safety procedures where height work is required, including safe and effective use of safety equipment
		6.4	Use appropriate communication methods and communication equipment to coordinate the rigging tasks
		6.5	Use associated plant and equipment according to SOPs and the appropriate standard
		6.6	Connect temporary guys, ties, propping and shoring, including flexible steel wire rope and tubing, as required
		6.7	Follow procedures to minimise disruption to other site operations
		6.8	Inspect the completed task according to the appropriate standard
7	**Finalise rigging task**	7.1	Obtain approval for completion of rigging task according to site or enterprise procedures
		7.2	Remove excess materials from the work area, as applicable
		7.3	Inspect rigging equipment, associated equipment, safety equipment and associated plant used during rigging task for damage and defects

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	7.4 Isolate all defective rigging equipment, associated equipment, associated plant and safety equipment, report and record according to SOPs
	7.5 Store rigging equipment and associated equipment according to SOPs and the appropriate standard
	7.6 Remove hazard prevention/control measures, as appropriate

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:	• poor condition of ground surfaces and attachment points • utility related hazards, including powerlines and conduits, gas and compressed air pipes, water and drainage services • site or external traffic (e.g. pedestrians and vehicles) • proximity to operating machinery unable to be stopped/isolated, including conveyors, boilers and transformers • restricted access • insufficient lighting • environmental conditions (e.g. wind, lightning and storms) • other specific hazards (e.g. proximity to dangerous materials)
Hazard control measures include the following:	• the systematic process of eliminating or reducing the risk to personnel and property through the application of controls

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	consistent with appropriate standards • the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: **1**. elimination **2.** substitution **3.** isolation **4.** engineering control measures **5.** using safe work practices **6.** personal protective equipment (PPE)
Appropriate standards include one (1) or more of the following:	• codes of practice and legislation • Australian Standards • manufacturer specifications • industry and enterprise standards, where applicable
Site information includes one (1) or more of the following:	• other work activities and equipment adjacent to or near area where rigging work is to be undertaken • location of services • ground surfaces and attachment points (e.g. concrete, steel plates and platform, columns and beams) • local conditions, such as access and egress • work method statements • site-specific job safety analyses and other site-specific documentation, as required • task plans/schedules and structural plans
Procedures for minimising disruption include the following:	• in conjunction with crane operators and doggers, planning of routes for load movements to avoid workstations, operating machinery, and walkways and roadways • coordinating rigging with other processes/adjacent sections to minimise downtime • planning rigging for efficient use of shared resources (e.g. bridge and gantry cranes)
Forces and loads include the following:	• dead loads • live loads

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- static load
- dynamic loads
- wind loads

Structures include one (1) or more of the following:

- structural steel
- steel plate and mesh
- bins and hoppers
- conveyor components
- machinery and equipment
- non-metallic equipment and components, including concrete, plastic and ceramic items, that need to be placed or erected on site

Associated plant includes one (1) or more of the following:

- static lines
- safety nets
- temporary and permanent hoists
- mast climbers
- loading platforms

Appropriate personnel include one (1) or more of the following:

- other riggers
- engineers
- supervisors
- technicians
- mechanical, electrical and fabrication tradespersons
- crane operators and doggers
- forklift drivers
- other workplace personnel who are authorised to take responsibility for supervising or assisting the rigging operation

Rigging equipment includes one (1) or more of the following:

- scaffolds
- elevated work platforms
- safety screens and shutters
- cranes:
  - non-slewing cranes
  - mobile slewing cranes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- vehicle loading cranes
- bridge and gantry cranes
- fixed and temporary hoists

Associated equipment includes one (1) or more of the following:

- all types of power and manually operated lifting gear
- fibre ropes
- flexible steel wire rope (FSWR)
- chains
- wire and synthetic slings
- shackles
- terminations
- wedge sockets
- eye bolts
- beam clamps
- plate clamps
- rope grips
- turnbuckles
- rigging screws
- chain blocks
- lever blocks
- lever-action winches
- sheaves
- spreader bars
- lifting beams
- jacks
- levers
- skates
- wedges
- rollers
- girder trolley

Procedures include one (1) or more of the following:

- manufacturer guidelines (instructions, specifications or checklists)
- industry operating procedures, including relevant codes of practice
- workplace procedures (work instructions, operating procedures and checklists)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Safety equipment includes the following:	• safety harness • energy absorber • lanyard • inertia reel • static safety lines • safety nets
Communication methods include one (1) or more of the following:	• verbal and non-verbal language • written instructions • signage • hand signals • listening • questioning to confirm understanding and appropriate worksite protocol **Note**: Mobile phones are not to be used for signalling purposes during the rigging process
Communication equipment includes one (1) or more of the following:	• fixed channel two-way radios • in-place intercom and other communication systems
Hazard prevention/control measures include one (1) or more of the following:	• safety tags on electrical switches/isolators • powerlines are insulated • safety observer used inside exclusion zone • power disconnected • traffic barricades and control • pedestrian barricades • trench covers • movement of obstructions • personal protective equipment • adequate illumination • safety shutters and screens

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Ground suitability includes one (1) or more of the following:	• bitumen • concrete • suspended concrete floors • earth floor • building roofs • landings • ground bearing pressure
Temporary connections include one (1) or more of the following:	• knots • bends • hitches • splicing • whipping
Flexible steel wire rope (FSWR) includes one (1) or more of the following:	Identification, uses, connections and termination (if applicable) of one or more of the following: • static lines • guys • purchase systems • lashing • cranes • hoist and winch ropes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11024A Undertake basic rigging

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11024 Undertake basic rigging

Modification History

Release 1. Supersedes and is equivalent to MEM11024A Undertake basic rigging

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting basic drawings, sketches and site plans, manufacturers' specifications and data for all plant and equipment used in rigging operations
- complying with work health and safety (WHS) licensing legislation
- communicating and working safely with others, including tradespersons, doggers and crane operators in the work area
- conducting risk assessment and management procedures
- calculating safe working load (SWL) and working load limit (WLL)
- inspecting relevant plant and equipment to ensure it is safe working condition
- installing and using safety equipment in accordance with SOPs
- demonstrating preparation of temporary connections
- working safely at heights, including the correct application of safety equipment
- erecting and dismantling structures,
- moving and correctly locating plant and equipment
- demonstrating the following knots, bends and hitches:
  - sheet bend, becket hitch, running bowline and double bowline
- demonstrating the following splices and whippings:
  - eye, back and short splice
  - sail makers and common whipping
  - west countryman's.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate mathematical procedures for estimation and measurement of loads
- principles relating to all plant, equipment and structural stability

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- types and functions of rigging, safety and associated equipment, including an understanding of their limitations
- organisational and workplace standards, requirements, policies and procedures for rigging
- sources of specialist knowledge and support in typical manufacturing sites, including engineers, technicians, tradespersons, and supervisors and managers
- relevant federal, state or territory and local government WHS legislation, standards and codes of practice for undertaking rigging activities
- inspection and maintenance requirements of a wide range of appropriate plant and equipment in line with Australian Standards or manufacturer specifications
- hierarchy of hazard identification and control
- minimum clearance distances from powerlines or electrical equipment as determined by the relevant state or territory authority or electrical supply authority
- estimation of ground bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking basic rigging at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM11025 Operate a non-slewing mobile crane of greater than three tonnes capacity

Modification History

Release 1. Supersedes and is equivalent to MEM11025A Operate a non-slewing mobile crane of greater than three tonnes capacity

Application

This unit of competency defines the skills and knowledge required to operate non-slewing mobile cranes of greater than three tonnes capacity in a manufacturing environment. It applies to cranes commonly referred to as yard cranes which require the crane to be moved for positioning to lift and lower loads. The cranes covered by this unit incorporate a boom or jig and include mobile cranes on articulated and non-articulated vehicles and cranes mounted on self-propelled or locomotive drawn rail vehicles inside a large manufacturing enterprise.

This unit is not recognised by regulators for licensing requirements. In order to satisfy licensing requirements, the imported unit TLILIC3006 Licence to operate a non-slewing mobile crane (greater than three tonnes capacity) will be required.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools, and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

Band A

Unit Weight 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Materials handling

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Obtain requirement for load lifting and/or transfer according to procedures
2	**Plan work**	2.1	Identify potential workplace hazards
		2.2	Identify hazard control measures consistent with appropriate standards to ensure the safety of personnel and equipment
		2.3	Identify and estimate the weight of the load in consultation with associated personnel
		2.4	Assess crane as appropriate to the load and workplace conditions
		2.5	Inspect and determine an appropriate path for the movement of loads in the work area
		2.6	Identify appropriate communication methods with associated personnel
3	**Conduct routine checks**	3.1	Check crane visually for any damage or defects
		3.2	Access crane in a safe manner

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.3	Ensure all signage and labels are visible and legible according to the appropriate standard
	3.4	Carry out routine pre-operational crane checks according to SOPs
	3.5	Locate and identify all controls
	3.6	Check crane service logbook for compliance
	3.7	Start crane according to SOPs and check for any abnormal noises
	3.8	Test all crane safety devices according to SOPs
	3.9	Carry out post-start operational checks according to SOPs
	3.10	Check all communication equipment for serviceability
	3.11	Report all damage and defects and record according to SOPs, and take appropriate action
4 **Set up crane**	4.1	Check ground suitability
	4.2	Drive crane to the work area according to SOPs
	4.3	Position crane for work application and stability according to SOPs
	4.4	Determine appropriate crane configuration for work task according to SOPs
	4.5	Input boom or jib and counterweight configuration data into the crane computer, as applicable
	4.6	Apply appropriate hazard prevention or control measures to the work area according to SOPs
	4.7	Test communication equipment for functionality
5 **Lift and transfer load**	5.1	Determine lifts within the capacity of the crane and environmental conditions

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	5.2	Position boom or jib and hoist block over load following directions from associated personnel
	5.3	Carry out test lift according to SOPs
	5.4	Lift loads and, where required, transfer or mobile using all relevant crane movements according to SOPs and the appropriate standard
	5.5	Follow appropriate path where load is transferred or mobiled
	5.6	Interpret all required communication signals according to SOPs and the appropriate standard
	5.7	Monitor load movement constantly, ensuring safety to personnel and stability of load and crane
	5.8	Respond to unplanned and unsafe situations in line with SOPs
6 **Shut down and secure crane**	6.1	Stow crane boom or jib and associated equipment and secure according to SOPs and the appropriate standard
	6.2	Apply relevant motion locks and brakes, where applicable
	6.3	Stow outriggers/stabilisers and secure according to SOPs, where applicable
	6.4	Shut down crane according to SOPs
	6.5	Carry out routine post-operational crane checks according to SOPs
	6.6	Stow plates or packing and secure, where applicable
	6.7	Record all damage and defects and report according to SOPs, and take appropriate action

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:

- ground stability (e.g. ground condition, recently filled trenches and slopes)
- overhead hazards (e.g. powerlines and service pipes)
- insufficient lighting
- traffic (e.g. pedestrians, vehicles and other plant)
- fixed equipment, including machinery, tanks and conveyors
- environmental conditions (e.g. wind, lightning and storms)
- other specific hazards (e.g. dangerous materials)

Hazard control measures include the following:

- the systematic process of eliminating or reducing the risk to personnel and property through the application of controls consistent with appropriate standards
- the application of the hierarchy of control, the six-step preference of control measures to manage and control risk:

  1. elimination

  2. substitution

  3. isolation

  4. engineering control measures

  5. using safe work practices

  6. personal protective equipment

Appropriate path includes one (1) or more of the following:

- one which maximises safety and stability during lifting and transferring, including mobile operation of the crane and depositing of the load
- one which minimises disruption to other operations in the enterprise
- one which without compromising safety, stability and avoidance of disruption, is the most efficient route for the transfer of the load

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate standards include one (1) or more of the following:	• codes of practice and legislation • Australian Standards • manufacturer specifications • enterprise and industry standards, where applicable
Associated personnel include one (1) or more of the following:	• doggers and riggers • forklift and truck drivers • production and trades employees
Environmental conditions include one (1) or more of the following:	• wind • lightning • storms • poor light • temperatures
Cranes include one (1) or more of the following:	• a crane (greater than three tonnes capacity) which meets the requirements of AS 1418 Set-2009 Cranes, hoists and winches Set • articulated type mobile cranes • locomotive hauled and self-propelled rail cranes
Communication methods include one (1) or more of the following:	• verbal and non-verbal language • written instructions • signage • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol
Signage and labels include one (1) or more of the following:	• crane data plates/labels/decals • load charts • control labels

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Procedures include one (1) or more of the following:	• manufacturer guidelines (instructions, specifications, operator's manual or checklists) • industry operating procedures • workplace procedures (work instructions, operating procedures and checklists)
Controls include one (1) or more of the following:	• luffing levers • hoisting and lowering levers • slewing levers, including brake • boom extension levers (where fitted)
Service logbook includes one (1) or more of the following:	• service book and any logbook • history record system where the service and maintenance history is kept
Crane safety devices include the following:	• horns/sirens/lights • audible and visual reversing devices • operator restraint devices
Communication equipment includes one (1) or more of the following:	• fixed channel two-way radios • whistles • bells and buzzers **Note**: Where radio communication equipment is used the transmitting frequencies of the equipment must be selected to prevent interference to or from other radio equipment being used in the vicinity of the crane
Ground suitability includes one (1) or more of the following:	• rough, uneven ground • backfilled ground • soft soils • hard, compacted soil • rock • bitumen • concrete

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Stability includes the following:

- deploying outriggers
- establishing correct size plates or packing
- correctly positioning plates or packing

Crane configuration includes the following:

- set up of crane for:
  - lift and lowering of loads where crane is not required to move (e.g. where a load is lifted of a truck and the truck then moves away to allow load to be lowered)
  - mobile load transfer where load is lifted and transferred to a different location by the crane
- boom/jib, fly-jib and counterweights

Hazard prevention/control measures include one (1) or more of the following:

- safety tags on electrical switches/isolators
- insulated power lines
- safety observer used inside exclusion zone
- disconnected power
- traffic barricades and controls
- pedestrian controls
- trench covers
- movement of obstructions
- personal protective equipment
- adequate illumination

Test lift includes the following:

- lifting the load just clear of the lifting plane to allow for checks to be safely made in consultation with associated personnel to ensure that:
  - near capacity loads do not overload the crane
  - loads of unusual shape or weight distribution are correctly slung
  - load measuring equipment can be used to verify the calculated weight of the load
  - all crane equipment is functioning properly
  - adjustments to the slinging can be made in a safe manner

Relevant crane movements include the

- telescope in and out
- boom/jib up and down

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following:	• articulating (as applicable) • raise and lower hoist (as applicable)
Communication signals include the following:	• stop – hand and whistle • hoist up – hand and whistle • hoist down – hand and whistle • luff boom down – hand and whistle • luff boom up – hand and whistle • telescope out – hand and whistle • telescope in – hand and whistle • slew/articulate right – hand and whistle • slew/articulate left – hand and whistle
Unplanned and/or unsafe situations include one (1) or more of the following:	• failure/loss of control (e.g. brakes and steering) • failure of equipment (e.g. hydraulic system) • environmental conditions (e.g. wind, lightning and storms)
Planned route includes one (1) or more of the following:	• unusual or difficult terrains • obstacles or obstruction
Best mobile practice includes the following:	• minimum speed • gentle acceleration and braking (to minimise load swing) • minimum boom/jib length • carrying the load near to the ground surface • use of handheld taglines
Shutdown includes the following:	• retracting boom/jib/fly, where applicable • retracting hoist rope and hook block • retracting outriggers/stabilisers, where applicable • idling engine to stabilise temperature and turning off engine

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM11025A Operate a non-slewing mobile crane of greater than three tonnes capacity

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM11025 Operate a non-slewing mobile crane of greater than three tonnes capacity

Modification History

Release 1. Supersedes and is equivalent to MEM11025A Operate a non-slewing mobile crane of greater than three tonnes capacity

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting safety signs and crane manufacturers' specifications and data, including load charts to enable crane to be configured for the load
- complying with work health and safety (WHS) licensing legislation
- communicating and working safely with others in the work area following SOPs
- assessing ground conditions to confirm site is suitable (e.g. firm, level and safe) to operate crane
- applying risk assessment and management procedures (particular awareness of the risks associated with overhead powerlines/electrical cables, ground conditions, crane tipping, other vehicles and personnel)
- operating a non-slewing mobile crane, including all functions to their maximum extension in the lifting and moving of loads to the safe working rated capacity of non-slewing mobile cranes (over three tonnes capacity), in conjunction with other associated personnel
- using appropriate mathematical procedures for estimation of loads
- conducting lifts and transfers to designated locations via appropriate paths.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate mathematical procedures for estimation and measurement of loads
- federal, state or territory WHS legislation, standards and codes of practice relevant to the full range of processes for the crane class
- crane characteristics and capabilities, including use of load charts, to allow the configuration of the crane to suit the range of loads
- organisational and workplace standards, requirements, policies and procedures for conducting operations for the crane class
- hierarchy of hazard identification and control

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- procedures for the recording, reporting and maintenance of workplace records and information
- typical routine problems encountered in the operation of the crane and equipment and adjustments required for correction.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating a non-slewing mobile crane of greater than three tonnes capacity at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12001 Use comparison and basic measuring devices

Modification History

Release 1. Supersedes and is equivalent to MEM12001B Use comparison and basic measuring devices

Application

This unit of competency defines the skills and knowledge required to sort items in a production environment or at a workstation using basic comparison measuring equipment.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Use comparison and/or basic measuring devices**	2.1	Identify and use measuring devices to undertake required comparisons or measurements using SOPs
		2.2	Undertake checking or sorting of items using comparison and/or basic measuring device according to SOPs
3	**Maintain comparison and/or basic measuring devices**	3.1	Maintain basic care and storage to manufacturers' standards or SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Basic measuring devices include the following:	• linear measuring devices measuring to within 1 mm graduation, including rules, tapes and retractable tapes
Comparisons include one (1) or more of the following:	• length • angle • size • temperature • pressure • weight • voltage • resistance • amperage
Comparison measuring devices include one (1) or more of the following:	• go/no-go devices • thread angle and taper gauges • temperature gauges • pressure gauges • measuring gauges and overlay indicators • templates • digital devices • pre-set verniers and micrometres

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12001B Use comparison and basic measuring devices

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12001 Use comparison and basic measuring devices

Modification History

Release 1. Supersedes and is equivalent to MEM12001B Use comparison and basic measuring devices

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting measurement requirements from specifications, including sketches and job instructions
- selecting appropriate basic measuring device to achieve the required outcome
- selecting appropriate comparison devices to achieve the required outcome
- obtaining measurements in a safe and effective manner in accordance with SOPs
- storing and maintaining measuring devices according to manufacturer's specifications or SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- use and application of various comparison and measurement devices
- procedures for the correct use of devices
- procedures for maintaining and storing devices.

Assessment Conditions

- Assessors must:
  - have vocational competency in using comparison and basic measuring devices at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12002 Perform electrical/electronic measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12002B Perform electrical/electronic measurement

Application

This unit of competency defines the skills and knowledge required to use basic electro-measuring devices to check variables and applies to the measurement of voltage, current, resistance, power and frequency on a.c. and d.c. circuits up to 1000 volts.

Measurement skills for specific applications and context are covered by other units.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where simple measurement tasks such as reading of fixed devices, testing continuity, and tasks requiring the use of devices mounted in for example measuring jigs unit MEM12001 Use comparison and basic measuring devices and unit MEM12023 Perform engineering measurements, should also be selected as appropriate.

Where electrical/electronic measuring devices require the connection or disconnection of circuitry appropriate units should also be selected.

In circumstances where the application of this unit or legislation dictates, relevant units covering first aid and/or emergency procedures should also be considered.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011 Undertake manual handling

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Use electro-measuring devices to measure variables**	2.1	Select appropriate device or equipment and setting to obtain required measurement
		2.2	Make appropriate connections to obtain required measurement using safe work practices
		2.3	Obtain readings and correctly interpret and make conversion into the required units of measurement, as necessary
3	**Maintain electro devices**	3.1	Undertake routine care and storage of devices to manufacturer's specifications or SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate device or equipment includes one (1) or more of the following:	• analogue/digital multimeters • clip-on meter • oscilloscopes • potentiometers
Routine care includes the following:	• zero and linear adjustments, inspection, check for serviceability and safe operation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12002B Perform electrical/electronic measurement

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12002 Perform electrical/electronic measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12002B Perform electrical/electronic measurement

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting measurement requirements from specifications, including sketches and job instructions, schematics, diagrams and technical manuals
- selecting appropriate measuring device to achieve the required outcome
- obtaining measurements by making appropriate connections in a safe and effective manner, interpreting results and recording measurements, as required
- storing and maintaining measuring devices, including undertaking routine care, according to manufacturer's specifications or SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- terminology and concepts relating to electrical/electronic measurement
- selection of different measuring devices for particular applications within the scope of this unit
- specifications of selected electro-measuring devices
- application of the settings on each electro-measuring device
- procedures for obtaining electrical/electronic measurements
- procedures for connecting electro-measuring devices to circuitry
- correct scale for each setting on the electro-measuring device
- scale factor to be applied to readings taken from the electro-measuring device
- units applying to electrical and electronic measurements
- precautions to be observed when using measuring devices
- loading effect of meters on a circuit
- maintenance and storage requirements for a range of electro-measuring devices.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing electrical/electronic measurement at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12003 Perform precision mechanical measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12003B Perform precision mechanical measurement

Application

This unit of competency defines the skills and knowledge required to perform precision mechanical measurement.

This unit covers comprehensive measuring skills where judgement is required in the selection of the most appropriate techniques/devices and where results are interpreted and/or analysed.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Perform precision measurement**	2.1	Select appropriate precision equipment to achieve specified outcome
		2.2	Check the accuracy of the selected measuring equipment for where appropriate
		2.3	Use correct and appropriate measuring techniques for the measurement task
		2.4	Take measurements to the finest graduation of instrument in an accurate manner
		2.5	Interpret readings and measurements
3	**Maintain precision equipment**	3.1	Set measuring equipment to specifications using manufacturer guidelines or procedures and techniques
		3.2	Adjust and maintain measuring equipment to required accuracy using appropriate techniques according to manufacturer’s specifications or SOPs
		3.3	Store equipment to manufacturer’s specifications or SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:

- strip gauges
- precision squares
- angle dekkors
- sine bars
- angle gauges
- polygons
- precision levels
- dial indicators
- vernier protractors
- shadow graphs
- vibration measurement equipment
- dynamic balancing equipment
- micrometres
- height gauges
- hardness testers
- texture measuring equipment

Measurements include one (1) or more of the following:

- length
- circular
- straightness
- flatness
- hardness
- angles
- finishes
- textures
- roundness
- squareness
- alignment and coordinate measurement

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12003B Perform precision mechanical measurement

Links

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Assessment Requirements for MEM12003 Perform precision mechanical measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12003B Perform precision mechanical measurement

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting measurement requirements from specifications, including sketches and job instructions, schematics, diagrams and technical manuals
- selecting appropriate measuring device or equipment to achieve the required outcome
- checking the accuracy of the selected measuring equipment where appropriate
- setting up measuring equipment where appropriate
- obtaining measurements on components or equipment in a safe and effective manner, interpreting results and recording measurements, as required
- storing and maintaining measuring devices including routine adjustments according to manufacturer's specifications or SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate precision mechanical measuring device for given measurement requirements
- procedures for verifying equipment being used has been recently calibrated
- procedures for obtaining a range of mechanical measurements and techniques to be used
- suitability of environmental conditions for the measurements being carried out
- setting precision mechanical measuring devices procedures
- accuracy to which a range of precision mechanical measuring devices can be read
- procedures for reading graduated mechanical measuring devices
- units of measurement and numerical operations within the scope of this unit
- specifications of the equipment to be set
- tools and equipment for setting mechanical measuring devices
- procedures and techniques required to undertake adjustments to a range of precision mechanical measuring devices

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- storage procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing precision mechanical measurement at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12004 Perform precision electrical/electronic measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12004B Perform precision electrical/electronic measurement

Application

This unit of competency defines the skills and knowledge required to undertake precision measurements across a range of frequencies on the full range of electrical/electronic equipment including a.c., d.c., analogue, digital and microwave equipment.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Use equipment for precision measurement**	2.1	Select appropriate equipment to achieve specified outcome
		2.2	Check the accuracy of the measuring equipment
		2.3	Use correct and appropriate measuring techniques
		2.4	Interpret readings and measurements
3	**Maintain precision equipment**	3.1	Set up equipment to specifications utilising manufacturers' specifications or standard techniques
		3.2	Adjust and maintain measuring equipment to required accuracy, utilising manufacturers' specifications or standard techniques
		3.3	Undertake care and storage of equipment to manufacturers' specifications or SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment for precision measurement includes one (1) or more of the following:	• analogue and digital meters • cathode ray oscilloscopes • bridges and potentiometers • wattmeters • digital probes
Measurement includes one (1) or more of the following:	• peak and transient voltages • transient frequencies • digital wave form analysis

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12004B Perform precision electrical/electronic measurement

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12004 Perform precision electrical/electronic measurement

Modification History

Release 1. Supersedes and is equivalent to MEM12004B Perform precision electrical/electronic measurement

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting measurement requirements from specifications, including sketches and job instructions, schematics, diagrams and technical manuals
- selecting appropriate measuring equipment to achieve the required outcome
- checking the accuracy of the selected measuring equipment where appropriate
- setting up measuring equipment where appropriate
- obtaining measurements and making appropriate connections in a safe and effective manner, interpreting results and recording measurements, as required
- storing and maintaining measuring equipment, including undertaking routine care according to manufacturer's specifications or SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications of the circuitry and/or components to be tested
- specifications of precision electrical/electronic measuring devices
- application of a range of precision electrical/electronic measuring devices
- procedures/techniques for obtaining and setting a range of electrical/electronic measurements
- units of measurement used in conjunction with precision electrical/electronic measurement
- specifications of the equipment to be set
- tools and equipment to be used in setting precision electrical/electronic measuring devices
- adjustments and procedures that can be made to a range of precision electrical/electronic measuring devices
- procedures for storing precision electrical/electronic measuring devices.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing precision electrical/electronic measurement at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM12005 Calibrate measuring equipment

Modification History

Release 1. Supersedes and is equivalent to MEM12005B Calibrate measuring equipment

Application

This unit of competency defines the skills and knowledge required to check measuring equipment for correct operation and validate/calibrate precision measuring equipment in accordance with predetermined procedures.

It applies to the calibration skills used in the setting, adjustment, validation or verification of precision mechanical and/or electrical/electronic measuring instruments using reference standards. This involves the use of electronic setting equipment and the selection or determination of an appropriate external standard.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

This unit is not meant to apply to simple zeroing, external adjustment or manual adjustment for size range, e.g. micrometres. These skills are covered by units:

- MEM12023 Perform engineering measurements
- MEM12003 Perform precision mechanical measurement
- MEM12004 Perform precision electrical/electronic measurement.

There may be occasions when both pathways units MEM12003 Perform precision mechanical measurement and MEM12002 Perform electrical/electronic measurement will be required.

Where additional electrical/electronic measurement skills are required unit MEM12004 Perform precision electrical/electronic measurement should also be selected.

Competence in this unit does not require the level of skill that applies to calibration as defined in ISO 9000 and/or carried out by personnel accredited under ISO/IEC 17025/NATA certification or similar. Unit MEM15010 Perform laboratory procedures should be considered for this level of calibration.

Where reference standards only are to be verified under laboratory conditions unit MEM15022 Verify reference standards should also be selected.

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Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

Path 1	MEM11011	Undertake manual handling
	MEM12003	Perform precision mechanical measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information
Path 2	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Check equipment for correct operation**	2.1	Check equipment for correct operation in accordance with manufacturers' specifications using appropriate tools, equipment and techniques
		2.2	Carry out appropriate checks of components, leads, fasteners for wear, loose connections or other faults
3	**Validate/calibrate precision measuring equipment**	3.1	Assess calibration of precision measuring equipment to manufacturers' specifications and/or SOPs
		3.2	Calibrate equipment against appropriate physical standards using correct calibration devices, equipment and techniques using predetermined procedures
		3.3	Recommission equipment in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Physical standards include one (1) or more of the following:	• mass • length • time • temperature • pressure • volume • process characteristics
Calibration devices and equipment include one (1) or more of the following:	• micrometre • vernier caliper • voltmeter • oscilloscope • all types of comparators • jigs and fixtures • templates and patterns
Recommissioned includes the following:	• sealing, tagging, identification or storage in accordance with SOPs

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12005B Calibrate measuring equipment

Links

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Assessment Requirements for MEM12005 Calibrate measuring equipment

Modification History

Release 1. Supersedes and is equivalent to MEM12005B Calibrate measuring equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking measuring equipment for correct operation and faults using appropriate tools and equipment
- selecting appropriate calibration devices and equipment to manufacturers' specification and procedures
- calibrating equipment to appropriate physical and reference standards for conformance to specifications and in accordance with manufacturers' manuals and SOPs
- recommissioning equipment in accordance SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- measuring equipment specifications, operation, wearing parts, connections and components
- checks that are to be made of the measuring equipment and the tools and equipment to be used when checking the measuring equipment
- common fault(s) that may be found in the measuring equipment
- effects of faults on the performance/accuracy of the measuring equipment
- relevant standards, legislative or regulatory requirements applicable to the measuring equipment and/or its calibration
- SOPs for calibrating and commissioning the measuring equipment and the tools and equipment required to do so
- calibration records to be kept/maintained in accordance with SOPs.

Assessment Conditions

- Assessors must:

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  - have vocational competency in calibrating measuring equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12006 Mark off/out (general engineering)

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM12006 Mark off/out (general engineering) (Release 1).

Release 1. Supersedes and is equivalent to MEM12006C Mark off/out (general engineering).

Application

This unit of competency has been developed for engineering tradesperson - mechanical apprenticeship training and the recognition of trade-level skills in marking off/out in general engineering.

Marking off/out is undertaken using appropriate tools and equipment and templates are produced as required. Marking off/out techniques may apply to a range of materials and shapes.

Skills covered by this unit are generally applied in occupational and work situations associated with trade-level fitting, machining and toolmaking work.

Where the task involves a simple transfer of a dimension or marking a location point associated with general engineering and maintenance functions, select one or more of the following units as appropriate:

- MEM07005 Perform general machining
- MEM18006 Perform precision fitting of engineering components
- MEM18014 Manufacture press tools and gauges.

Where the manufacture of marked out components is required, appropriate units should also be selected.

Where a higher level of calculation is required unit MEM12026 Perform advanced trade calculations in a manufacturing, engineering or related environment should also be selected.

Where a higher level of measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where a higher level of precision work is required unit MEM18003 Use tools for precision work should also be selected.

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Where marking out structural fabrications and shapes is required unit MEM12007 Mark off/out structural fabrications and shapes should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		requirements at all times
	1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
	1.5	Select appropriate methods and sequencing consistent with job requirements
2 **Transfer dimension**	2.1	Carry out all marking off/out to specifications using appropriate tools and equipment
	2.2	Establish datum points
	2.3	Transfer dimensions and undertake appropriate calculations, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:

- marking out tables
- surface tables
- rotary tables
- dividing heads
- vee blocks
- cylinder squares

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- sine bars
- vernier height gauges
- protractors
- straight edge and set squares
- hammers
- scribers
- centre punch
- marking medium

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM12006 Mark off/out (general engineering) (Release 1).

Release 1. Supersedes and is equivalent to MEM12006C Mark off/out (general engineering).

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12006 Mark off/out (general engineering)

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM12006 Mark off/out (general engineering) (Release 1).

Release 1. Supersedes and is equivalent to MEM12006C Mark off/out (general engineering).

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for marking out requirements, including measurements and tolerances
- carrying out all marking off/out using tools and equipment to specifications
- calculating measurements not shown on drawings, as required
- establishing and marking datum points
- transferring measurements, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- drawings, job instructions and specifications
- procedures for marking off/out
- tools, equipment and techniques related to the task
- purpose of establishing datum points
- method of determining/calculating dimensions.

Assessment Conditions

- Assessors must:
  - have vocational competency in marking off/out (general engineering) at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12007 Mark off/out structural fabrications and shapes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM12007 Mark off/out structural fabrications and shapes (Release 1).

Release 1. Supersedes and is equivalent to MEM12007D Mark off/out structural fabrications and shapes.

Application

This unit of competency been developed for engineering tradesperson - fabrication apprenticeship training and the recognition of trade-level skills in mark off/out of structural fabrications and shapes.

It applies to the marking off/out of general fabrications and shapes to specified measurements, tolerances and shapes using appropriate tools and equipment. Templates and patterns are produced as required.

Skills covered by this unit are generally applied in occupational and work situations associated with steel fabrication, boiler making or sheet metal work.

In a marine setting, it includes basic lofting/set out for construction of marine vessels and includes stem and transom development and use of tables of offsets that reflect chine and hull configuration. This includes lofting surfaces, straight edges, string lines, French curves and templates and marking out techniques apply to a range of materials and shapes.

Where more extensive lofting practices are required unit MEM09021 Interpret and produce drawings of curved 3-D shapes should also be selected.

Where marking out of general engineering components is required unit MEM12006 Mark off/out (general engineering) should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Transfer dimensions from a detail drawing to work or**	2.1	Determine and understand specifications and work requirements using correct and appropriate calculations
		2.2	Carry out marking out to specifications or procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	surface		using appropriate tools and equipment
		2.3	Establish datum points
3	**Make templates/ patterns as required**	3.1	Chose appropriate template/pattern material, as required
		3.2	Produce required templates to specifications
		3.3	Follow correct storage procedures, including labelling and identification to SOPs
4	**Develop patterns and/or transfer measurements to structures**	4.1	Chose and apply most appropriate development and/or measurement sequence
		4.2	Determine allowances for fabrication and assembly and transfer
		4.3	Check measurement transfer/layout of components to ensure accuracy/set out
5	**Interpret relevant codes, standards and symbols**	5.1	Interpret relevant standards/codes and symbols
		5.2	Interpret requirements of standards/codes and apply to materials and processes
6	**Estimate quantities of materials from detail drawings**	6.1	Identify materials
		6.2	Estimate quantities from drawing
		6.3	Minimise material wastage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Template materials include one (1) or more of the following:	• steel plate • perspex • timber • cardboard • paper
Storage procedures include one (1) or more of the following:	• labelling • identification (e.g. template lofts)
Allowances include one (1) or more of the following:	• thickness • bend • pitch • angle • circumference • perimeter

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM12007 Mark off/out structural fabrications and shapes (Release 1).

Release 1. Supersedes and is equivalent to MEM12007D Mark off/out structural fabrications and shapes.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12007 Mark off/out structural fabrications and shapes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM12007 Mark off/out structural fabrications and shapes (Release 1).

Release 1. Supersedes and is equivalent to MEM12007D Mark off/out structural fabrications and shapes.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs)and safe work practices
- identifying and interpreting specifications and drawings for fabrication requirements, including materials, measurements and tolerances, joining methods, standards and code requirements
- carrying out all marking off/out using appropriate marking out tools and equipment to specifications
- calculating measurements not shown on drawings, as required
- establishing and marking datum points
- selecting appropriate template material and producing templates to specifications
- storing templates, including labelling and identification, to procedures, as required
- developing patterns by selecting and applying appropriate development and/or measurement sequence and determining correct allowances for fabrication and assembly and transferring these measurements
- calculating allowances for fabrication and assembly, including shrinkage, thickness and inside/outside measurements, and transferring these measurements
- identifying and estimating quantities of materials from drawings with minimise wastage.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for marking off/out and pattern development
- tools and equipment to be used in the preparation of the marking off/out
- datum points
- materials that can be used for the preparation of templates and their application
- manufacturing allowances that have to be considered when developing patterns

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- template labelling and identification procedures and storage requirements of templates
- appropriate methods of development/marking off/out of a range of given objects
- appropriate fabrication and assembly allowances
- effects of material type and thickness on fabrication and assembly allowances
- sources of data on fabrication and assembly allowances
- relevant standards and codes and the meaning of symbols used
- requirements of the codes/standards applicable to the work to be done
- materials from which the component/assembly is to be manufactured
- benefits of minimising material wastage.

Assessment Conditions

- Assessors must:
  - have vocational competency in marking off/out structural fabrications and shapes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM12019 Measure components using coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12019B Measure components using coordinate measuring machines

Application

This unit of competency defines the skills and knowledge required to operate coordinate measuring machines (CMM) in a production environment, including basic setting up of components and manually aligning probes.

Where other machines/processes are to be adjusted as a consequence of the CMM operation, appropriate machining/process operation units should also be selected.

Where basic operation excludes setting up components and manually aligning probes is required unit MEM07024 Operate and monitor machine and process should also be selected.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015 Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Load components**	2.1	Undertake pre-start checks in accordance with SOPs
		2.2	Observe correct safety procedures and check safety equipment for correct operation
		2.3	Select correct fixture/clamping device
		2.4	Load and clamp component and fixtures in accordance with SOPs
3	**Set probes**	3.1	Check probe configuration in accordance with specifications
		3.2	Take pre-measurement manual hits to determine probe alignment in accordance with SOPs
4	**Measure**	4.1	Select, run and verify part program, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
components	4.2 Measure components utilising appropriate measuring devices
	4.3 Interpret results and identify and report non-conforming/out-of-tolerance measurements
	4.4 Shut down part program and remove components
	4.5 Leave coordinate measuring machine, accessories and surrounds in a clean, safe condition

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Probes include one (1) or more of the following:	• solid trigger probes • electronic trigger probes
Measure components includes the following:	• are limited to those which can be measured directly and do not require measurements to be constructed mathematically
Coordinate measurement machines include one (1) or more of the following:	• manual machines • machines fitted with microprocessors

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12019B Measure components using coordinate measuring machines

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12019 Measure components using coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12019B Measure components using coordinate measuring machines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and sketches for selecting appropriate methods for measuring components using coordinate measuring machines (CMM)
- selecting and loading components and fixtures using appropriate fixture/clamping device
- setting and manually aligning probes in accordance with specifications
- selecting and activating part programs, as required, where machine is fitted with microprocessors and measuring components and interpreting results and reporting all anomalies in accordance with SOPs
- shutting down part program and removing components and cleaning CMMs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- task-related information on job sheets or equivalent
- pre-start checks
- fixtures/clamping devices, methods and their uses
- storage location and procedures
- procedures for undertaking pre-measurement manual hits for manual alignment and checking probe configuration
- procedures for running and verifying part program
- procedures, methods/techniques for interpreting results and reporting results and recommendations for adjustment
- effects of contamination
- procedures for shutting down part program
- safe removal and handling of components procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in measuring components using coordinate measuring machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12020 Set and operate coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12020B Set and operate coordinate measuring machines

Application

This unit of competency defines the skills and knowledge required to set and operate a range of coordinate measuring machines (CMM).

Appropriate levels of measurement, computer operations and drawing skills should be selected with this unit.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where a selection and use of tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Interpret drawing information and a range of tolerances that apply to components and establish datums
2	**Set up/orient components**	2.1	Undertake pre-start checks in accordance with SOPs
		2.2	Observe correct safety procedures and check all equipment for safe operation
		2.3	Determine the most appropriate method of clamping/support to minimise distortion and maximise measuring access
		2.4	Set up and orient component/fixture/clamping devices
3	**Select and activate part programs**	3.1	Identify and verify part program, as required
		3.2	Activate selected part program in accordance with SOPs
4	**Prepare CMM**	4.1	Determine probe configuration according to specifications
		4.2	Adjust probe configuration on CMM according to SOPs
		4.3	Check probe angles for compliance and adjust, as required
		4.4	Re-calibrate CMM
		4.5	Align probes manually for one-off components

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Measure components**	5.1 Edit part program to compensate for errors or changes to component specifications
	5.2 Measure components and check for conformance to specification
	5.3 Produce data/report

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

CMMs include one (1) or more of the following:	• manual machines • machines fitted with microprocessors • horizontal vertical and gantry tie machines
Probes include one (1) or more of the following:	• solid trigger probes • electronic trigger probes
Measure components include the following:	• those which can be measured directly and those that require measurements to be constructed mathematically

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12020B Set and operate coordinate measuring machines

Links

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Assessment Requirements for MEM12020 Set and operate coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12020B Set and operate coordinate measuring machines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for selecting appropriate methods for measuring components using coordinate measuring machines (CMMs)
- selecting and setting up and orienting appropriate component/fixture/ clamping device to minimise distortion and maximise measuring access
- selecting and loading part programs and activating in accordance with SOPs
- loading and configuring probes, checking probes angles and adjusting for compliance and re-setting/re-calibrating CMM in accordance with specifications
- manually aligning probes for one off components
- identifying problems/errors in programs and carrying out editing to ensure accurate operation
- checking results against drawings/specifications and interpreting for non-conformance and completing reports.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles and methods of coordinate measurement
- principles and interpretation of geometric tolerancing
- task-related information, symbols and terminology
- pre-start checks
- types and functions of various fixtures/clamping devices
- principles and methods of clamping
- efficient set-up/orientation procedure
- procedures to locate and activate part program
- procedures to verify changes/upgrades to part programs

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- various probes and their uses and configurations and setting and adjusting probes
- requirements and procedures for re-setting/re-calibrating the CMM
- procedure and reason for taking manual hits
- procedures for editing part programs
- procedure for interpreting results
- procedure for maintaining records and reporting procedures
- techniques, tools and equipment to measure components.

Assessment Conditions

- Assessors must:
  - have vocational competency in setting and operating coordinate measuring machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12021 Program coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12021B Program coordinate measuring machines

Application

This unit of competency defines the skills and knowledge required to write, trial and edit basic programs for a range of coordinate measuring machines (CMMs) to measure features of a part in a single work plane using a single probe.

Appropriate levels of measuring, computer and engineering drawing skills should be selected with this unit.

Where programming using multiple probes and more than one plane is required unit MEM12022 Program coordinate measuring machines (advanced) should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify part program parameters**	2.1	Select appropriate units to comply with specifications
		2.2	Specify part program name according to SOPs
3	**Establish single probe configurations**	3.1	Determine single probe configuration
		3.2	Determine probe angles and qualify in accordance with SOPs
4	**Position/align component**	4.1	Position and orient component/part to specifications
		4.2	Create manual alignment according to SOPs
		4.3	Create single direct computer control (DCC) alignment according to SOPs
5	**Measure features**	5.1	Measure features and define probe movement parameters according to SOPs
		5.2	Dimension basic features according to specifications
		5.3	Report operator notes
		5.4	Insert dimension descriptions

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
6 **Verify and back up the program**	6.1 Verify execution and accuracy of program according to SOPs
	6.2 Edit program, if required
	6.3 Output results to various formats according SOPs
	6.4 Archive and back up program

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12021B Program coordinate measuring machines

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12021 Program coordinate measuring machines

Modification History

Release 1. Supersedes and is equivalent to MEM12021B Program coordinate measuring machines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate units and identifying part program in accordance with current identification and/or quality system to comply with specifications
- determining single probe configuration and calculating/determining and qualifying probe angles in accordance with SOPs
- undertaking numerical operations, geometry and calculations/formula applicable to programming coordinate measuring machine (CMM)
- positioning/aligning/securing component/part to appropriate orientation on CMM table and complying with probe configuration and calibrated angles
- taking an appropriate number of hits to create an accurate manual alignment
- demonstrating the correct procedure for creating direct computer control (DCC) alignment
- measuring features in correct sequence and location in a single work plane
- dimensioning basic features, including circles and points
- verifying execution and accuracy of program and editing according to SOPs, as required
- outputting results to various formats, including printer, disc or other format and backing up and archiving program, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles and methods of coordinate measurement
- principles and interpretation of geometric tolerancing
- procedure for producing the part program
- procedures and parameters for naming programs
- procedures and reasons for determining single probe configuration
- procedures for determining/calculating probe angles
- procedures and parameters for qualification

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- specifications for the program
- criteria for selecting specific units
- reasons for the specific location and aligning/securing the component/part
- method of securing/clamping
- methodology used to create manual alignment for the part
- procedures for creating a single DCC alignment and reasons for selection
- criteria for defining probe movement
- procedures for verifying correct probe movement
- dimensioning techniques
- procedures for running the program and verifying the results
- editing process and explanations
- method used to archive and back up the program
- access limitations by personnel and quality control guidelines
- procedures for outputting results to various formats.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming coordinate measuring machines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM12022 Program coordinate measuring machines (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM12022B Program coordinate measuring machines (advanced)

Application

This unit of competency defines the skills and knowledge required to write, trial and edit programs for a range of coordinate measuring machines (CMMs) to measure features of parts in multiple planes using multiple probes.

Where programming using single probes in a single plane is required unit MEM12021 Program coordinate measuring machines should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Determine part parameters and measurement requirements
		1.6	Establish program attributes according to SOPs
2	**Determine probe configuration for multiple probes**	2.1	Determine probe configuration
		2.2	Determine probe angles and qualify multiple probes
3	**Create multiple direct computer control (DCC) alignment**	3.1	Create multiple DCC alignment according to SOPs
		3.2	Integrate DCC sub-routines
4	**Construct advanced geometric features**	4.1	Determine and construct geometric features
		4.2	Dimension features according to specifications
5	**Review and maintain part programs/system**	5.1	Review/edit part programs to comply with changes to specifications
		5.2	Change system wide options
		5.3	Output results to various formats according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.4 Archive and back up programs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12022B Program coordinate measuring machines (advanced)

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12022 Program coordinate measuring machines (advanced)

Modification History

Release 1. Supersedes and is equivalent to MEM12022B Program coordinate measuring machines (advanced)

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining program parameters from job instructions, specifications, charts, lists, drawing and other applicable reference documents
- selecting suitable probes and determining probe configuration and determining and qualifying probe angles in accordance with SOPs
- undertaking numerical operations, geometry and calculations/formula for determining program parameters and checking tolerances
- demonstrating the correct procedure for creating multiple direct computer control (DCC) alignment and integrating new and existing DCC sub-routines
- constructing geometric features for the program and reviewing and editing program to specification
- changing system-wide operations to ensure the most efficient operation of the program
- outputting results to various formats, including printer, disc or other format and backing up and archiving program, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- program specifications
- procedure for producing the program
- parameters for selecting attributes
- procedures for determining multiple probe configuration and probe angles and reasons for selection
- qualification procedure
- procedure for creating DCC alignment
- critical differences between single and multiple DCC alignment
- problems due to integrating sub-routines

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- advantages gained through integration of DCC sub-routines
- procedure for constructing geometric features in the sequence followed and reasons that apply
- procedure for ensuring the dimensioning techniques comply with relevant standards
- procedure for ensuring all notes/instructions are clear and logical
- procedures and parameters for editing, archiving and backing up programs
- effects of editing particular sections of the program
- effects on other programs of changing software or hardware options
- procedures for changing system-wide options
- list of recipients or those with access rights to the programs
- procedures for producing/storing results/reports
- procedure for notifying personnel of completion of the program is explained
- techniques, tools and equipment to measure components.

Assessment Conditions

- Assessors must:
  - have vocational competency in programming coordinate measuring machines (advanced) at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12023 Perform engineering measurements

Modification History

Release 1. Supersedes and is equivalent to MEM12023A Perform engineering measurements

Application

This unit of competency defines the skills and knowledge required to perform measurements requiring straightforward use of mechanical measuring devices which incorporate visual inspections representing units of measurement and associated calculations in a range of manufacturing, engineering and related environments. Measurements may be expressed in metric or imperial units.

Electrical/electronic devices used are those not requiring the connection or disconnection of circuitry.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **5**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select appropriate device or equipment**	2.1	Determine measurement requirements from specifications
		2.2	Select appropriate device or equipment to achieve required outcome according to SOPs
3	**Obtain measurements using a range of measuring devices**	3.1	Use correct and appropriate measuring technique
		3.2	Obtain measurements accurately in a safe and effective manner
		3.3	Determine or verify dimensions using calculations, as required
4	**Maintain measuring devices**	4.1	Undertake routine care and storage of devices to manufacturers' specifications or SOPs
		4.2	Make routine adjustments to devices to maintain device accuracy
5	**Communicate measurements as required**	5.1	Record measurements accurately, as required
		5.2	Prepare freehand sketch which depicts required information, as required

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Specifications include one (1) or more of the following:	• drawings • sketches • job instructions • schematics • diagrams • reference manuals
Measuring devices include one (1) or more of the following:	• protractors • combination squares • set squares • dial indicators • thermometers • tapes • rules • micrometres • vernier-scaled measuring equipment
Calculations include one (1) or more of the following:	• addition • subtraction • multiplication • division • fractions • decimals **Note:** Calculations may be made using a calculator
Routine adjustments	• validating the device using simple zeroing or scale adjustment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include the following:

Measurements include one (1) or more of the following:	• length • squareness • flatness • angle • roundness • clearances • any other measurements that can be read off analogue, digital or other measuring device
Information includes one (1) or more of the following:	• dimensions • instructions • base line • datum points

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12023A Perform engineering measurements

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12023 Perform engineering measurements

Modification History

Release 1. Supersedes and is equivalent to MEM12023A Perform engineering measurements

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting measurement requirements from specifications
- selecting appropriate measuring device or equipment to achieve the required outcome
- obtaining measurements in a safe and effective manner and recording measurements, including preparing a freehand sketch which depicts required information, as required
- performing calculations to determine or verify dimensions
- storing and maintaining measuring devices including routine adjustments according to manufacturer's specifications or SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- correct application of a range of measuring devices
- correct and appropriate measuring technique for a range of measuring devices
- calculations, including addition, subtraction, multiplication, division, fractions and decimals
- manufacturer's or SOPs for handling and storing a range of measuring devices
- appropriate procedures for adjusting and zeroing a range of measuring devices, including scale adjustment
- appropriate methods of communicating measurements by drawings.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing engineering measurements at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12024 Perform computations

Modification History

Release 1. Supersedes and is equivalent to MEM12024A Perform computations

Application

This unit of competency defines the skills and knowledge required to estimate approximate answers to arithmetical problems, carry out calculations involving percentages and proportions, and determine simple ratios and averages.

It also covers producing and interpreting simple charts and graphs in manufacturing, engineering or related environments.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS)

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		requirements at all times
	1.3	Identify job requirements from specifications, sketches, job sheets or work instructions
	1.4	Establish required calculation outcomes from job instructions
	1.5	Determine required calculation method to suit the application, including selection of relevant arithmetic operations and/or formulae
	1.6	Estimate expected results, including rounding off, as appropriate
2 **Perform calculations**	2.1	Apply calculation method
	2.2	Obtain answer and check against estimation to ensure it is correct
3 **Produce charts and graphs from given information**	3.1	Transpose data to produce charts or graphs
	3.2	Ensure charts or graphs reflect data on which they are based to meet specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Calculations are performed using one (1) or more of the following:	• pen and paper • a calculator • tables • tablets • computers
Relevant sources include one (1) or more of the following:	• charts • graphs • diagrams • measurement data • reference manuals • specifications
Applications include computations associated with one (1) or more of the following:	• pressure • volume • temperature • heat • speed • power • elasticity • density • mass • force
Arithmetic operations include the following:	• application of subtraction, addition, multiplication and division • manipulation of decimals, fractions and mixed numbers and whole numbers • using formulas • determining percentages • calculation of proportions and ratios
Charts and graphs include one (1) or more of the following:	• simple histograms • control charts • pie charts

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12024A Perform computations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12024 Perform computations

Modification History

Release 1. Supersedes and is equivalent to MEM12024A Perform computations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting data from job instructions and relevant sources to establish required outcomes
- determining the appropriate calculation method to suit the application
- performing calculations and confirming answer/s
- producing and interpreting simple charts and graphs from given data.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- formulae applicable to the determination of perimeter, area and volume of simple geometric shapes and the reasons for using dimensions with the same units
- techniques and procedures for rounding off figures when estimating approximate answers
- features and use of mixed numbers, decimals, fractions and whole numbers
- procedures for carrying out calculations involving fractions and using each of the four basic rules of addition, subtraction, multiplication and division
- concept of percentage and procedures to be followed in converting a decimal and fraction to a percentage
- concepts and calculations of ratio and proportion
- scales applicable to the axes of the graphs or charts
- types of charts and/or graphs used in the individual's field of work
- upper and lower limits of acceptability applicable to data entered on a graph or chart
- trends indicated by the slope or gradient of a graph
- action to be taken when given trends occur or set limits are approached on graphs or charts
- procedures for drawing 'lines of best fit'
- trends indicated by the graphs or charts drawn.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing computations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12025 Use graphical techniques and perform simple statistical computations

Modification History

Release 1. Supersedes and is equivalent to MEM12025A Use graphical techniques and perform simple statistical computations

Application

This unit of competency defines the skills and knowledge required to interpret and construct graphs and charts from given or determined data, and perform basic statistical calculations.

Graphs and charts apply to information from various work contexts, quality processes, production and market trends and other engineering applications and a range of devices are used to assist with calculations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **2**

Pre-requisite Unit

MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Read and construct graphs from given or determined data**	2.1	Extract complex information from graphical representation
		2.2	Analyse data with respect to emerging trends
		2.3	Construct graphs as required from data and draw with respect to scale and accepted method
		2.4	Interpret significant features of graphical representation
3	**Perform basic statistical calculations**	3.1	Calculate mean, median and mode from given data
		3.2	Calculate standard deviation
		3.3	Apply application of standard deviation and limits to process improvement techniques

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Features of graphical representations include one (1) or more of the following:	• limit lines • gradients (straight line graphs) • intercepts • maximum and minimum values
Graphs include one (1) or more of the following:	• histograms • control charts • straight line graphs • parabolic graphs
Process improvement techniques include the following:	• techniques in which error rates are mathematically calculated and recorded, including three sigma and six sigma **NOTE**: This unit gives the underpinning calculation skill for these techniques and does not cover the implementation or use of three or six sigma systems

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM12025A Use graphical techniques and perform simple statistical computations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12025 Use graphical techniques and perform simple statistical computations

Modification History

Release 1. Supersedes and is equivalent to MEM12025A Use graphical techniques and perform simple statistical computations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting data presented in graphical form and analysing the emerging trends indicated by the data
- constructing graphs to scale for which the graph is intended and labelling the axis appropriately
- constructing graphs to suit the job requirements
- performing basic statistical calculations, including mean, median and mode and determining from that data the standard deviation
- undertaking numerical operations, geometry, calculations and formula for using graphical techniques and performing simple statistical computations
- applying standard deviation to process improvement techniques in which error rates are mathematically calculated and recorded
- checking performance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- characteristics of straight line, parabolic and hyperbolic curves
- procedures for determining the slope/rate of change of a curve
- trends indicated by changes in gradient of a graph
- procedures for drawing the line of best fit for the coordinates plotted
- standard form of equations relating to straight lines and parabolic curves
- gradient, intercepts, maximum and minimum values and limit lines for straight line and parabolic curves
- function of control charts
- meaning of the terms mean, median and mode

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- meaning of the term standard deviation
- significance of 1, 2 and 3 sigma limits.

Assessment Conditions

- Assessors must:
  - have vocational competency in using graphical techniques and performing simple statistical computations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM12026 Perform advanced trade calculations in a manufacturing, engineering or related environment

Modification History

Release 1. New unit

Application

This unit of competency defines the skills and knowledge required to apply advanced mathematics to appropriate engineering post-trade situations within the individual's area of work.

It applies to the use of trigonometry, the sine and cosine rules, work-related formulae, geometric principles relevant to the workplace and the calculation of areas and volumes of common engineering shapes.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Measurement

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.4	Establish required calculation outcomes from job instructions
2	**Determine required calculation method**	2.1	Determine required calculation method to suit the application, including selection of relevant formulae
		2.2	Estimate expected results, including rounding off, as appropriate
3	**Apply calculation method**	3.1	Apply calculation method to obtain accurate answer
		3.2	Check answer against estimation

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Calculations are performed using one (1)	• pen and paper • a calculator

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:	• tables • tablets • computers
Calculations include establishing solutions associated with one (1) or more of the following:	• angles • lengths • areas • perimeters • volumes

Calculation methods include the following:	• trigonometry:
	  • basic functions
	  • sine rule
	  • cosine rule
	• Pythagoras Theorem
	• geometry

Unit Mapping Information

Release 1. No equivalent unit

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM12026 Perform advanced trade calculations in a manufacturing, engineering or related environment

Modification History

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- obtaining and interpreting data from specifications, drawings, job sheets or work instructions to establish required outcomes
- determining the appropriate calculation method to suit the application
- performing calculations using:
  - trigonometric ratios
  - Pythagoras Theorem
  - geometric formulae
- manipulation of formulae to change the subject
- checking answers using estimations.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- formulae applicable to the determination of perimeter, area and volume of simple geometric shapes
- the reasons for ensuring calculations are carried out using the same units of measurement
- nomenclature used in trigonometry, Pythagoras' Theorem and geometry
- mathematical principles and order of operations
- techniques and procedures for rounding off figures when estimating approximate answers
- applications of geometric calculations in manufacturing and engineering situations.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing computations at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13001 Perform emergency first aid

Modification History

Release 1. Supersedes and is equivalent to MEM13001B Perform emergency first aid

Application

This unit of competency defines the skills and knowledge required to apply the administration of basic emergency first aid treatment and the management of life threatening situations where an unconscious person requires expired air resuscitation (EAR) and cardiopulmonary resuscitation (CPR).

This unit does not meet all of the requirements expected of designated First Aid Officers.

The competencies required for situations involving isolation of persons from hazardous electrical situations is covered in unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.. and unit MEM18050 Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c..

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
2	**Perform emergency first aid**	2.1	Demonstrate correct procedures for expired air resuscitation (EAR) and cardiopulmonary resuscitation (CPR) on a mannequin
		2.2	Carry out first aid treatment of injuries
		2.3	Record details of first aid administered
		2.4	Demonstrate understanding of relevant regulatory and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Injuries include the following:

- burns/scalds
- fractures
- cuts and abrasions
- poisoning
- foreign bodies in eyes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- concussion and shock

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13001B Perform emergency first aid

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13001 Perform emergency first aid

Modification History

Release 1. Supersedes and is equivalent to MEM13001B Perform emergency first aid

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- demonstrating correct procedures for expired air resuscitation (EAR) and cardiopulmonary resuscitation (CPR) on a mannequin
- simulating first aid treatment of the following:
  - cuts/abrasions and fractures
  - burns/scalds
  - concussion and shock
  - foreign bodies in eyes
  - poisoning
- recording details of first aid administered.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- applicable regulatory and legislative requirements
- instances where EAR and CPR should be performed
- procedures for preparing a person for the administration of EAR and CPR
- procedures for performing EAR and CPR on a child and an adult
- dangers and precautions to be taken when administering EAR and CPR
- emergency first aid procedures for injuries covered by the scope of this unit
- details to be recorded of first aid administered
- procedures and reasons for recording first aid administered
- relevant regulatory and legislative requirements with respect to emergency first aid
- impact of regulatory/legislative requirements on the individual and others.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing emergency first aid at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace condition. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13002 Undertake work health and safety activities in the workplace

Modification History

Release 1. Supersedes and is equivalent to MEM13002B Undertake occupational health and safety activities in the workplace

Application

This unit of competency defines the skills and knowledge required to apply principles of work health and safety (WHS) in the workplace and undertake a safety risk assessment for the employee's area of responsibility and applies to employees requiring additional WHS competencies beyond those inherent in their job.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Use appropriate personal protective equipment (PPE) in accordance with SOPs
2	**Apply principles of WHS in a workplace**	2.1	Describe basic WHS principles of hazard identification, risk assessment and control
		2.2	Demonstrate understanding of WHS legislation as it is applied in the workplace
3	**Carry out safety audit**	3.1	Carry out regular safety audits in the area of responsibility in accordance with appropriate WHS standards
4	**Identify WHS improvements**	4.1	Raise WHS issues and suggestions for improvements to WHS representatives and committees, as appropriate
		4.2	Identify hazards and make recommendations for their control on the basis of safety audits or as required
		4.3	Make contributions to safety improvements using SOPs
		4.4	Identify WHS training needs
5	**Follow requirements of enterprise WHS program**	5.1	Ensure requirements of the WHS program are satisfied within the area of responsibility, including accident investigation and emergency procedures, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Risk assessment is a process that includes the following:	• analysing the risk to identify influencing factors and the range of potential consequences
	• assessing:
	  • the effectiveness of existing controls
	  • the likelihood of each consequence considering exposure and hazard level
	• and, combining these in some way to obtain a level of risk

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13002B Undertake occupational health and safety activities in the workplace

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13002 Undertake work health and safety activities in the workplace

Modification History

Release 1. Supersedes and is equivalent to MEM13002B Undertake occupational health and safety activities in the workplace

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- describing the risk assessment process
- reading and interpreting audit and safety-related documentation
- performing safety audits by following audit and work health and safety (WHS) procedures
- making recommendations for safety improvements and communicating effectively about WHS activities with workplace personnel
- identifying training needs and initiating WHS training
- meeting requirements of the WHS program and procedures in the individual’s area of responsibility
- entering information onto audit reports and other relevant documents.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of hazard identification, assessment and control as applied to the workplace
- procedures for hazard identification, assessment and control
- application of WHS legislation in the workplace
- procedures for conducting safety audits
- safety standards applicable to the individual's area of responsibility
- frequency at which safety audits should be conducted
- procedures for implementing WHS improvements
- means of rectifying given or identified hazards and reasons for selecting the chosen means of rectifying the hazard
- authority to whom recommended WHS improvements are to be reported
- procedures for making safety improvements
- requirement for WHS training in the individual's area of responsibility

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- objectives of WHS training and procedures for initiating WHS training
- accident investigation procedures
- emergency WHS procedures
- role of the individual in carrying out accident investigations and emergency procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking work health and safety activities in the workplace at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13003 Work safely with industrial chemicals and materials

Modification History

Release 1. Supersedes and is equivalent to MEM13003B Work safely with industrial chemicals and materials

Application

This unit of competency defines the skills and knowledge required to work safely with industrial chemicals and materials subject to codes and regulations that are stored and used in a workplace, for example, chemicals, solvents, dangerous materials, acids and noxious waste products in a manufacturing and/or engineering environment.

This unit describes the competencies which are beyond those safety requirements normally applied in the workplace as described in unit MEM13015 Work safely and effectively in manufacturing and engineering, or specifically described in individual units, such as welding.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Evidence of competency is to encompass the satisfactory application of current state/territory work health and safety (WHS) legislation, standards and codes of practice, and the hierarchy of hazard control measures.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Work health and safety

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Use personal protective equipment**	2.1	Select correct and appropriate personal protective equipment (PPE) and use correctly based on information in relevant safety data sheet (SDS)
3	**Adhere to emergency procedures**	3.1	Locate emergency equipment and use in accordance with workplace policies and SOPs
		3.2	Demonstrate responses to emergency procedures as detailed in approved safety procedures and instructions
4	**Observe safe working practices**	4.1	Identify hazardous areas and materials and understand and identify special handling procedures and obtain permits to work, if necessary
		4.2	Use all equipment and hazardous materials in accordance with relevant WHS legislation, manufacturers' instructions and SOPs
		4.3	Identify and understand all site-specific safety policies, safety signs, symbols and labels
		4.4	Interpret and apply SDS
		4.5	Use safe manual handling procedures, including equipment

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.6 Ensure decanted chemicals and storage is to state/territory dangerous goods, WHS legislation and requirements
	4.7 Update chemical manifest following SOPs
	4.8 Perform housekeeping duties to maintain a safe working environment according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hierarchy of control measures include the following:	The application of the hierarchy of control follows the six-step preference of control measures to manage and control risk: **1**. elimination **2.** substitution **3.** isolation **4.** engineering control measures **5.** using safe work practices **6.** personal protective equipment (PPE)
PPE includes one (1) or more of the following:	• goggles/face shields • respirators • air supplied or self-contained helmets • safety boots • gloves and appropriate clothes/garments

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Safe working practices include one (1) or more of the following:	• environment is inspected • hazards (and chemical reactive hazards) are assessed and controlled using hierarchy of hazard control • properly maintained PPE is available • emergency management plan is documented/understood • work to be undertaken in safe 'thermal' environments and all possible ignition sources are to be identified and controlled
Storage includes the following:	• only using containers, which includes minor quantities and those in consumer packages, that are suitable for chemical exposure • labelling and/or placarding containers • updating chemical manifests
State or territory legislative requirements include one (1) or more of the following:	• appropriate WHS • dangerous goods acts and regulations • Australian Standards • Australian Code for the Transport of Dangerous Goods by Road and Rail (ADGC) • Safe Work Australia codes of practice

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13003B Work safely with industrial chemicals and materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13003 Work safely with industrial chemicals and materials

Modification History

Release 1. Supersedes and is equivalent to MEM13003B Work safely with industrial chemicals and materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate PPE based on data obtained in relevant safety data sheets (DS)
- observing safe working practices including undertaking a risk assessment
- following approved safety procedures and instructions in demonstrating responses to real or simulated emergencies
- performing proper manual handling techniques when shifting and moving industrial chemicals and materials
- ensuring all decanted chemicals are stored in storage containers that are suitable for chemical exposure and are properly labelled and/or placarded
- updating chemical manifests following SOPs
- complying with appropriate state or territory legislative requirements at all times.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- dangerous goods classification and labelling/placarding
- testing and maintenance of PPE
- inherent hazardous properties of the chemicals to be used
- interpretation of the relevant safety data sheets (SDS)
- basic fire-fighting procedures
- site-specific emergency plan procedures
- chemical spill confinement procedures
- dangerous occurrence (near miss) reporting procedures
- hierarchy of controls.

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Assessment Conditions

- Assessors must:
  - have vocational competency in working safely with industrial chemicals and materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13004 Work safely with molten metals/glass

Modification History

Supersedes and is equivalent to MEM13004B Work safely with molten metals/glass

Application

This unit of competency defines the skills and knowledge required to work safely in a heavy engineering environment in which there are molten metals or glass, for example, in foundries, die casting operations, glass or molten glass operations and explosives manufacture.

Evidence of competency is to encompass the satisfactory application of any current state/territory work health and safety (WHS) legislation, standards and codes of practice, and the hierarchy of hazard control measures.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Use personal protective equipment (PPE)**	2.1	Select correct and appropriate PPE and use correctly based on WHS information relating to specific hazards
3	**Adhere to emergency procedures**	3.1	Locate emergency equipment and use in accordance with workplace policies and SOPs
		3.2	Demonstrate responses to emergency procedures as detailed in approved safety procedures and instructions
4	**Identify, assess and control hazardous conditions**	4.1	Identify and report hazards and undertake planning to maintain a healthy and safe work environment
		4.2	Follow workplace procedures and work instructions for controlling risks
5	**Observe safe working practices**	5.1	Identify hazardous areas and materials associated with molten metals or glass and identify potential risks
		5.2	Identify and understand safety signs and symbols
		5.3	Inspect PPE and maintain in good order and store for reuse
		5.4	Identify, remove, assess and control hazardous items associated with task from hot material area, if required
		5.5	Perform housekeeping duties to maintain a safe working environment according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hierarchy of control measures include the following:

The application of the hierarchy of control follows the six-step preference of control measures to manage and control risk:

1. elimination
2. substitution
3. isolation
4. engineering control measures
5. using safe work practices
6. personal protective equipment (PPE)

PPE includes one (1) or more of the following:

- face protection
- eye protection
- respiratory protection
- hearing protection
- hand protection
- clothing and footwear protection

Hazardous material includes one (1) or more of the following:

- hot material
- molten metals
- molten glass and associated products
- explosive materials

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Unit Mapping Information

Supersedes and is equivalent to MEM13004B Work safely with molten metals/glass

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13004 Work safely with molten metals/glass

Modification History

Supersedes and is equivalent to MEM13004B Work safely with molten metals/glass

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- using appropriate personal protective equipment (PPE) as specified in work health and safety (WHS) requirements and SOPs
- responding to emergency procedures for incidents, including fires, accidents and spillage
- handling hazardous materials and equipment in accordance with procedures
- following workplace procedures to control risks that includes the likelihood and consequences of injury or damage and identifying and reporting hazardous conditions and taking actions to rectify hazards
- interpreting text and numerical (e.g. quantities, units of measurement) information on safety data sheets (SDS), safety signs, symbols and labels
- using appropriate manual handling techniques and equipment in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures relevant to raising WHS issues
- rights and responsibilities of workplace parties under WHS Acts, regulations and codes of practice
- designated personnel responsible for WHS
- emergency procedures, safety signs, symbols and labels
- procedures for correct inspection and service of equipment, including PPE
- routine maintenance procedures for equipment
- workplace procedures for working in hazardous areas
- consequences of not maintaining a clean and safe working environment
- specific hazards associated with the work environment/industry
- safe manual handling procedures

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- location of emergency equipment, including first aid facilities
- hierarchy of controls.

Assessment Conditions

- Assessors must:
  - have vocational competency in working safely with molten metals/glass at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13006 Collect and evaluate work health and safety data for an enterprise or section of an enterprise

Modification History

Release 1. Supersedes and is equivalent to MEM13006B Collect and evaluate occupational health and safety data for an enterprise or section of an enterprise

Application

This unit of competency defines the skills and knowledge required to carry out standard work health and safety (WHS) measurements, collect and evaluate data, maintain records and report hazards. Data collected would typically relate to factors associated with temperature, noise (noise meter) and dust (Draeger tubes).

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Carry out standard WHS measurement and evaluate data**	2.1	Collect data using standard equipment in accordance with manufacturers' specifications
		2.2	Evaluate data from measurements taken to identify non-conformance with WHS standards
3	**Report outcomes of data evaluation**	3.1	Report results requiring remedial action to appropriate personnel using SOPs
		3.2	Prepare reports to detail data findings
		3.3	Report and record non-compliances and non-conformances
		3.4	Maintain records in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Data includes the following:

- factors associated with temperature, noise (noise meter) and dust (Draeger tubes)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13006B Collect and evaluate occupational health and safety data for an enterprise or section of an enterprise

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13006 Collect and evaluate work health and safety data for an enterprise or section of an enterprise

Modification History

Release 1. Supersedes and is equivalent to MEM13006B Collect and evaluate occupational health and safety data for an enterprise or section of an enterprise

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts and other applicable reference documents to collect and evaluate work health and safety (WHS) data
- collecting and evaluating data from required measurements in accordance with manufacturers' specifications and procedures
- using numerical operations and calculations associated with collecting and evaluating WHS data
- detecting and reporting hazards and preparing reports requiring remedial action in accordance with procedures
- maintaining records of the WHS factors monitored in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- measurements to be taken and recorded and procedures for taking each type of measurement
- tools, techniques and equipment required to carry out the measurements
- WHS standards for each factor being measured
- variations between the data collected and the appropriate WHS standard
- probable causes of the variation of the data collected from the WHS standard
- procedures for maintaining records of WHS factors measured
- procedures for reporting hazards and the authority to whom hazards are to be reported.

Assessment Conditions

- Assessors must:

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  - have vocational competency in collecting and evaluating work health and safety data for an enterprise or section of an enterprise at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13007 Maintain water treatment systems for cooling towers

Modification History

Release 1. Supersedes and is equivalent to MEM13007B Maintain water treatment systems for cooling towers

Application

This unit of competency defines the skills and knowledge required to test water treatment as specified by AS/NZS 3666:2011 Air-handling and water systems of buildings, or equivalent, measure water properties, and maintains reticulation/treatment systems.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Work health and safety

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Apply principles of AS/NZS 3666:2011 Air-handling and water systems of buildings, or equivalent**	2.1	Explain causes of corrosion, scale, algae and treatment/prevention
		2.2	Explain air distribution of cooling towers
3	**Assess reticulation system**	3.1	Assess relevant water conditions against specifications using test equipment according to SOPs
		3.2	Assess condition of water circulation system and determine appropriate action
		3.3	Assess performance of regulating, filtering, conditioning/dosing and pumping systems against specification
4	**Measure relevant water properties**	4.1	Use and apply test equipment according to SOPs
		4.2	Determine/record water properties

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
5	**Maintain reticulation/ treatment systems**	5.1	Record water temperature control system and report non-compliances
		5.2	Adjust dosing to specification
		5.3	Report faults to appropriate personnel according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Relevant water conditions include one (1) or more of the following:	• acidity • alkalinity • microbial • corrosion

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13007B Maintain water treatment systems for cooling towers

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13007 Maintain water treatment systems for cooling towers

Modification History

Release 1. Supersedes and is equivalent to MEM13007B Maintain water treatment systems for cooling towers

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts and other applicable reference documents in maintaining water treatment systems for cooling towers
- assessing relevant water conditions against specifications
- testing the condition of the water in the cooling tower/treatment system and determining appropriate action
- testing dosing components for correct operation/performance
- testing water properties using appropriate techniques and equipment and checking for compliance to specifications
- determining and recording test results and adjusting dosing flow in the system to specification
- reporting system faults to appropriate personnel.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- causes of corrosion, scale and algae
- methods of treating/preventing occurrence of corrosion, scale and/or algae in water cooling towers and treatment systems
- air flow patterns of cooling towers
- testing requirements of AS/NZS 3666:2011 Air-handling and water systems of buildings, and/or other relevant regulations relating to water cooling towers
- precautions for preventing contamination of systems by Legionella bacteria
- procedures for testing the condition of the water in the cooling tower
- specifications of the water condition
- variations of the test results from specification and procedures to be followed when water condition varies from specification

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- correct operation/performance of the following system components: regulators, filters, conditioners and pumps related to treatment systems
- performance tests for treatment system components
- water properties to be tested and procedures for testing water properties
- test equipment and techniques
- water temperature specifications
- procedures for reporting system faults
- codes and regulations relevant to maintaining water treatment systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining water treatment systems for cooling towers at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13010 Supervise work health and safety in an industrial work environment

Modification History

Release 1. Supersedes and is equivalent to MEM13010A Supervise occupational health and safety in an industrial environment

Application

This unit of competency defines the skills and knowledge required to supervise implementation of work health and safety (WHS) practices and procedures in a section of a workplace in manufacturing, production, engineering and related industry environments.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13002	Undertake work health and safety activities in the workplace
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Implement WHS procedures for work site or section**	2.1	Identify legislative requirements for the work section and work supervisor
		2.2	Establish consultation mechanisms for the work section
		2.3	Allocate personal protective equipment (PPE) to all staff, as required
		2.4	Establish safety and housekeeping practices and procedures for the worksite or section
		2.5	Check tools and equipment for suitability and serviceability
		2.6	Establish safety monitoring procedures
		2.7	Rectify non-conformances with WHS legislative requirements
3	**Assess risks and apply risk management strategies for work site or section**	3.1	Identify hazards and assess risks in the work site or section
		3.2	Implement appropriate risk control measures
		3.3	Assess control measures for effectiveness in controlling the risk
		3.4	Monitor hazards
		3.5	Determine the need for expert advice to manage risks
		3.6	Conduct accident investigations to determine cause, as required
4	**Supervise others**	4.1	Supervise communication on WHS matters

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	in the implementation of WHS procedures in the worksite or section	4.2	Identify WHS training needs for the work section
		4.3	Coordinate, evaluate and document WHS training and communication activity according to legislative requirements and organisational procedure
		4.4	Coordinate statutory WHS training requirements and document according to legislative requirements and organisational procedure
5	**Maintain records and statistics**	5.1	Maintain accident/incident records
		5.2	Analyse records for trends, and identify particular problem areas

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Consultation mechanisms include one (1) or more of the following:	• WHS committees • WHS representation • toolbox meetings • safety meetings • record keeping systems
PPE includes one (1) or more of the following:	• safety boots • gloves • goggles

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- glasses
- ear muffs
- hard hats
- clothing
- respirators or masks
- reflective vests

Safety and housekeeping practices and procedures include one (1) or more of the following:

- emergency/evacuation procedures
- tool and equipment cleaning
- maintenance and storage procedures
- safety reporting and documentation procedures
- barricades and signage
- procedures for managing hazardous chemicals and materials

Hazards include one (1) or more of the following:

- tools and equipment
- lighting
- gases
- electricity and water
- toxic and hazardous substances
- flammable materials and fire hazards
- lifting practices
- working in confined spaces
- working at height
- spillage
- waste and debris
- noise
- mobile plants including forklifts and front end loaders
- moving parts of machinery
- gravity (falls from heights)
- dusts

Risks include the following:

- the chance of something happening that will result in injury or damage. It is measured in terms of consequences and likelihood

Risk control measures

The application of the hierarchy of control follows the six-step

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include the following: preference of control measures to manage and control risk:

1. elimination
2. substitution
3. isolation
4. engineering control measures
5. using safe work practices
6. personal protective equipment (PPE)

Communication includes one (1) or more of the following:

- signage and labelling
- hazard identification notices
- access to policies
- procedures
- SOPs
- meeting notices
- documentation procedures
- reporting procedures
- meetings

Supervised includes one (1) or more of the following:

- coordinated
- implemented
- referred
- delegated
- facilitated
- monitored
- documented

Training needs include one (1) or more of the following:

- induction programs
- technical training
- coaching and mentoring
- supervision
- specialist training
- on site/off site
- involvement of training specialists
- organisational training requirements
- referral to training personnel

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13010A Supervise occupational health and safety in an industrial environment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13010 Supervise work health and safety in an industrial work environment

Modification History

Release 1. Supersedes and is equivalent to MEM13010A Supervise occupational health and safety in an industrial environment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting information on work health and safety (WHS) legislation, workplace practices and procedures, specifications, charts, lists and other applicable reference documents
- establishing consultation mechanisms in sections of the work site
- scheduling meetings and keeping records/minutes of discussions with consultative forums on WHS matters
- supervising the allocation of personal protective equipment (PPE) to all staff
- establishing safety and housekeeping practices and procedures
- rectifying WHS legislative requirement non-conformances
- keeping records for monitoring the effectiveness of work practices and procedures with respect to the safety of the working environment
- identifying hazards and assessing risks and implementing risk control measures
- assessing control measures for effectiveness in controlling the risk
- monitoring hazards
- determining the need for expert advice in the identification and control of workplace hazards
- investigating accidents in accordance with procedures to determine the cause, as required
- supervising communication of WHS matters
- identifying training needs for a particular work section
- maintaining accident and incident records in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- legislative requirements for the workplace and supervisory responsibilities

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- procedures for initiating discussions with the relevant consultative forums
- relevant consultative forums
- frequency of discussions to be held with the relevant consultative forums
- organisational WHS communication requirements
- WHS training practices, procedures and options available
- work practices and procedures developed in conjunction with the relevant consultative forums
- effect of work practices and procedures on the safety of the working environment
- procedures for monitoring the success of the work practices and procedures developed
- procedure for rectifying WHS legislative requirement non-compliances
- variables to be recorded during the monitoring process
- sources of information and expertise on WHS issues
- procedures for conducting accident investigations
- principles and hierarchy of hazard control measures and reasons for progressively implementing the hierarchy of control of hazards and the mechanisms for controlling hazards
- likely causes of accidents investigated
- procedures for accessing expertise external to the workplace
- procedures for recording accidents and incidents
- probable causes of trends or problem areas.

Assessment Conditions

- Assessors must:
  - have vocational competency in supervising work health and safety in an industrial work environment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13013 Work safely with ionizing radiation

Modification History

Release 1. Supersedes and is equivalent to MEM13013B Work safely with ionizing radiation

Application

This unit of competency defines the skills and knowledge required to work safely with ionizing radiation when performing radiographic testing in a range of open or closed industrial applications on fabrications, structures and components across a wide range of industries.

The work can relate to scheduled and unscheduled maintenance activities, using general tools, specific radiographic testing equipment as specified in maintenance documentation, testing procedures or operator instructions.

All testing must be completed with particular attention to personal and work health and safety (WHS) regulations. Certification against Australian Standards can be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712 Non-destructive testing – Qualification and certification of non-destructive testing (NDT) personnel.

Materials and chemicals which are subject to codes and regulations – for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products – must be subject to safe work habits and must be stored and used in accordance with safe work practices.

This unit is a prerequisite to undertaking any other radiographic units of competency.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

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Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Work health and safety

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify the hazards and effects of ionizing radiation in the workplace**	2.1	Identify the source of ionizing radiation in accordance with relevant organisational policy and procedures
		2.2	Outline attenuation factors of ionizing radiation and the biological effects on living tissue
		2.3	Identify the biological effects of radiation
3	**Apply radiation safety procedures/plans**	3.1	Employ appropriate ionizing radiation protective measures in accordance with relevant organisational policy and procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.2	State and adhere to exposure limits for personnel as laid down by the radiation authorities in Australia
		3.3	Determine minimum exposure rates/distances from calculations and charts
		3.4	Operate ionizing radiation sources in accordance with legislation, standards and/or organisational policy, procedures or guidelines
4	**Select and use radiation monitoring equipment**	4.1	Select the tools and equipment necessary to monitor radiation and use, as required
		4.2	Select and apply techniques and system verification checks necessary to monitor radiation
		4.3	Document safety breaches and/or report in accordance with organisational policy and procedures
5	**Respond to emergency situations**	5.1	Demonstrate procedures for dealing with both X-ray and gamma ray emergency situations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Radiation safe work	• ensuring security of radiation sources during storage, transport

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

practices and controls include the following:

and use

- using signs, barriers, shielding to minimise radiation exposure of public
- reducing personal exposure time
- maintaining greatest feasible distance between radiation source and equipment operator
- using maximum feasible shielding between radiation source and equipment operator
- using a dosimeter to monitor personal radiation exposure
- maintaining statutory records of the use of radiation sources and/or instruments that emit ionising radiation

Standards and codes include the following:

- the latest version of all relevant Australian and international standards and codes applicable to radiographic testing
  - AS 2177 Non-destructive testing—Radiography of welded butt joints in metal
  - AS 3507.1 Non-destructive testing - Guide to radiography for ferrous castings
  - ISO 9712 Non-destructive testing -- Qualification and certification of NDT personnel
- codes of practice from Australian and overseas engineering and technical associations and societies

WHS, regulatory requirements and workplace procedures include:

- WHS Acts and regulations
- industry codes of practice
- risk assessments
- safe work practices
- workplace documents, such as:
  - SOPs
  - quality procedures
  - equipment manuals
  - calibration and maintenance schedules
  - safety data sheets (SDS)
  - safety procedures
  - work schedules
  - workplace recording and reporting procedures
  - waste minimisation
  - containment, processing and safe disposal procedures

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- codes, regulations and safe work practices covering the use, handling, storage and transport of:
  - radiation sources
  - instruments that emit ionising radiation
  - dangerous materials such as chemicals, solvents, acids, or noxious waste products

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM13013B Work safely with ionizing radiation

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13013 Work safely with ionizing radiation

Modification History

Release 1. Supersedes and is equivalent to MEM13013B Work safely with ionizing radiation

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, specifications, relevant organisational policy and procedures and other applicable reference documents in working safely with ionizing radiation
- employing appropriate ionizing radiation protective measures and personal protective equipment (PPE) relevant to the industrial application
- determining minimum exposure rates/distances from calculations and charts
- undertaking numerical operations and calculations associated with determining minimum exposure rates/distances
- selecting and using appropriate tools and equipment necessary to monitor radiation
- documenting all safety breaches and recording/reporting in accordance with SOPs
- demonstrating the ability to assess risks and handle emergencies.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- International System of Units (SI) of radiation in accordance with the National Health and Medical Research Council (NHMRC)/statutory requirements
- production of X-rays and gamma rays in relation to radiographic testing activities
- principal radioactive sources used in industrial radiography
- attenuation factors
- known biological effects of radiation
- general principles of gas ionisation, photographic effect and luminescence
- use of film, film badges, ionisation chamber devices, quartz fibre, fluorescent, and electronic devices accuracy limits (energy/range)
- different SI units of radiation, including Becquerel, Sievert and Gray
- exposure limits for personnel as laid down by the radiation authorities in Australia

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- exposure reduction factors, including:
  - time
  - distance
  - shielding
- procedures for establishing safe working barriers
- relevant techniques and checks
- emergency procedures
- safety procedures for:
  - types of X-ray equipment
  - types of isotope cameras
  - shielding materials
  - design and requirements for exposure areas
  - requirements for storage of radioisotopes
- emergency situations, causes and appropriate responses
- storage requirements of equipment and materials
- legal requirements including:
  - Australian, state/territory regulations, code of practice (detail)
  - International Commission on Radiological Protection (ICRP) recommended limits for various persons and various parts of the body for short-term, long-term and accumulated exposure
  - background radiation
  - duties of Radiation Safety Officer (RSO)
  - requirements for transport
  - International Air Transport Association (IATA) regulations
  - obligations of the licensee.

Assessment Conditions

- Assessors must:
  - have vocational competency in working safely with ionizing radiation at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13015 Work safely and effectively in manufacturing and engineering

Modification History

Release 1. New unit. Supersedes and not equivelant to MEM13014A Apply principles of occupational health and safety in the work environment, MEM14004A Plan to undertake a routine task, MEM15002A Apply quality systems, MEM15024A Apply quality procedures, MEM16007A Work with others in a manufacturing, engineering or related environment.

Application

This unit of competency defines the skills and knowledge required to work effectively in manufacturing and engineering work situations, including planning routine work and participating in and following work health and safety (WHS) procedures. The unit applies to working either individually or in a team situation and includes contributing to work-related group activities in a manufacturing or engineering workplace.

This unit covers WHS skills associated with carrying out routine operational activities safely and in compliance with legislative and regulatory requirements.

The unit covers the skills associated with participation in quality systems, communication and cooperation with others. The unit applies to workplaces with informal or formal quality management and improvement systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

Nil.

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Identify goals, objectives and task requirements and clarify with appropriate persons, where required
		1.2	Prioritise task requirements
2	**Review and modify plan**	2.1	Adjust timelines, priorities and other planning components to respond to contingencies, as necessary
		2.2	Re-examine results of work activity against the plan and identify possible improvements to future performance of work tasks
3	**Work effectively with others in the workplace**	3.1	Identify own role and responsibilities and relationship to other employees, including employees performing related/interdependent activities
		3.2	Identify supervisors and other sources of advice and assistance for own work
		3.3	Apply effective interpersonal skills to interact with others and contribute to activities and objectives
		3.4	Review and modify own work progress to complement the work of others
		3.5	Report own work progress to supervisors and where required to fellow employees using standard operating procedures (SOPs)
4	**Follow safe work practices**	4.1	Check for and identify hazards in the work area before and during work
		4.2	Follow procedures for avoiding or controlling hazards already identified in instructions, signage or other workplace communication
		4.3	Identify and report risks and hazards not covered by procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		4.4 Select, use and maintain relevant personal protective equipment (PPE) by procedures, as required
		4.5 Recognise emergency situations and take appropriate initial emergency action
		4.6 Follow procedures for responding to emergencies
		4.7 Report incidents, injuries and other WHS non-conformances according to procedures
5	**Work within a quality system**	5.1 Follow instructions and procedures and perform duties in accordance with standard operating procedures or quality system requirements
		5.2 Ensure conformance of product and process to specifications
		5.3 Report defects and non-conformance to specifications according to procedures
		5.4 Participate in process improvement procedures, where required
6	**Participate in workplace health and safety procedures**	6.1 Identify workplace health and safety policies and procedures relevant to own work and work area
		6.2 Identify relevant WHS managers and representatives for own work area
		6.3 Provide input to minimise hazards in work area in line with organisation WHS procedures and participative arrangements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Quality systems include one (1) or more of the following	• quality planning • quality assurance • quality control • quality improvement procedures and processes
Task requirements include one (1) or more of the following:	• timeframe • quality requirements • outcome and performance requirements • job history • checks • reporting requirements • tools and equipment • materials and parts • supporting documents
Specifications include one (1) or more of the following:	• task lists • instructions • manufacturer manuals • diagrams and schematics • sketches • parts lists • SOPs
Planning includes one (1) or more of the following:	• preparing a plan to complete the task • organising task into manageable steps including appropriate order and timing • monitoring the progress of processes related to own responsibilities • applying relevant WHS instructions • collecting, sorting, recording results of work • seeking advice and guidance on setting priorities and timeframes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- seeking feedback from supervisor, trainer or mentor

Unit Mapping Information

Release 1. New unit. Supersedes and not equivelant to MEM13014A Apply principles of occupational health and safety in the work environment, MEM14004A Plan to undertake a routine task, MEM15002A Apply quality systems, MEM15024A Apply quality procedures, MEM16007A Work with others in a manufacturing, engineering or related environment.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13015 Work safely and effectively in manufacturing and engineering

Modification History

Release 1. New unit. Supersedes and not equivelant to MEM13014A Apply principles of occupational health and safety in the work environment, MEM14004A Plan to undertake a routine task, MEM15002A Apply quality systems, MEM15024A Apply quality procedures, MEM16007A Work with others in a manufacturing, engineering or related environment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and avoiding or controlling hazards
- reporting hazards, incidents, injuries and other work health and safety (WHS) non-conformances following SOPs
- recognising and responding to emergencies following SOPs
- identifying and obtaining, instructions and information on job requirements, including one or more of the following:
  - verbal or written job instructions
  - specifications
  - SOPs
  - charts
  - lists
- identifying and responding to contingencies, including:
  - equipment breakdowns
  - non-conforming components
  - safety hazards
- recording information into proforma workplace documents, including:
  - production tally forms
  - quality control forms
  - safety incident forms
- performing assigned tasks and checking outcome of own work for conformance to specifications
- identifying own responsibilities within the workplace quality system
- giving and receiving feedback on own and group work
- seeking assistance from supervisors and mentors.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use and application of personal protective equipment
- basic quality system terminology and concept, including:
  - quality assurance
  - quality control
  - quality improvement
- procedures to be followed in performing own work
- objectives, requirements and specifications to which the individual's work is to comply
- costs and consequences of poor quality
- effective interpersonal skills:
  - effective listening
  - basic speaking skills
  - use of workplace terminology and jargon
  - giving and receiving feedback
  - checking and clarifying task-related information
  - verbal, visual and written instructions
  - appropriate modes and methods of communication
- barriers to effective communication
- sources of technical expertise/assistance
- hazards and control measures associated with workplace activities.

Assessment Conditions

- Assessors must:
  - have vocational competency in working safely and effectively in manufacturing and engineering at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13016 Work in hazardous areas

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in working in hazardous areas.

It covers the basic requirements for performing installation and maintenance work on electrical equipment in hazardous areas. It provides a fundamental understanding of hazardous areas with regard to Electrical Equipment for Hazardous Areas (EEHA) principles, hazardous area classification definitions and factors affecting this aspect, protection techniques, ex-certification, competency requirements for personnel affecting hazardous areas, relevant standards and restrictions to repair work.

If more extensive skills are required for hazardous areas then the appropriate national accredited unit/s should be selected.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering

Competency Field

Work health and safety

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Prepare to work in hazardous areas	2.1	Ascertain and interpret the area classification regarding zoning, gas group and temperature class from hazardous area layout drawings
		2.2	Identify factors that may affect the classification of an area
		2.3	Identify relevant hazards specific to hazardous areas and implement appropriate risk control measures
		2.4	Obtain specialist tools, equipment and testing devices needed to carry out maintenance work
3.	Work in hazardous areas	3.1	Carry out maintenance work in accordance with specifications and procedures
		3.2	Check and test equipment to ensure functionality and complies with appropriate documentation
		3.3	Identify hazardous area defective and unsuitable equipment and components for the application and source replacement items with the appropriate equipment certification
		3.4	Carry out adjustment and/or permitted repairs to equipment using appropriate tools, equipment and techniques to specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4. Complete work in hazardous areas	4.1 Ensure all completed work and testing complies with the relevant EEHA Standards
	4.2 Record all inspection and maintenance activities according to established procedures and regulatory requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Compliance with relevant EEHA Standards includes:

- hazardous area classification of the area regarding zone, gas group and temperature class
- factors affecting the zoning of an area
- protection technique of the equipment
- ex-certification
- competency requirements for personnel working on the equipment and the required supervision
- which repairs to the equipment may be restricted
- unauthorised modifications
- manufacturer specifications

Unit Mapping Information

No equivalent unit

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM13016 Work in hazardous areas

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, SOPs and safe work practices
- obtaining the relevant work permits and informing appropriate personnel prior to commencing work
- identifying and interpreting hazardous layout drawings and interpreting markings of hazardous areas classifications relevant to the work to be undertaken
- identifying hazards specific to hazardous areas and implementing appropriate risk control measures
- checking and testing equipment to ensure functionality of equipment
- identifying defective or unsuitable equipment and sourcing replacement items with the correct equipment certification
- carrying out adjustments or permitted repairs using appropriate tools, equipment and techniques in accordance with procedures and specifications
- ensuring all completed work and testing complies with the relevant EEHA standard along with equipment conformity certificate requirements and special conditions
- documenting all inspection and maintenance work in accordance regulatory requirements and SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- history and reasoning behind the EEHA Standards and accreditation creation
- aspects of hazardous area classification regarding zoning, gas group and temperature class
- markings of classifications on technical drawings
- situations which may alter the source of release conditions, thereby affecting the classification of an area
- hazards specific to hazardous areas
- different methods of protection, including:

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  - Ex-d
  - Ex-e
  - Ex-n
  - Ex-l
  - Ex-p
  - Ex-m
- relationship between the classification ratings of the equipment to the classification ratings of the area
- importance of earthing
- testing and certifying bodies, including International Electrotechnical Commission (IEC), Ex, ATEX, AUSEx, CSA and Fm
- documentation required for inspections.

Assessment Conditions

Assessors must:

- have vocational competency in working in hazardous areas at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM13017 Apply safety practices, procedures and compliance standards associated with licensed electrical work

Modification History

Release 3. Prerequisite units update

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in working safely with electrical installations and equipment; following work health and safety (WHS) systems and procedures; and the scope, application and fundamental principles of AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules).

It covers knowledge of the application of WHS regulations; procedures for identifying and mitigating electrical hazards; supervision requirements applying to apprentices and trainees; following documented safe work methods, including safe isolation procedures: and application of compliance standards to ensure electrical installations and equipment are safe to use.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 45 – Demonstrate the knowledge and practices that are essential for working safely with electrical equipment and tools, for safe manual handling, working safely at heights and in confined spaces. Knowledge of testing and tagging procedures to AS 3760.
- EPC 55 – Demonstrate knowledge and application of electricity generation systems and electricity converters and the requirements of AS/NZS 3000 Wiring Rules for stand-alone and grid connected systems. Basic knowledge of battery storage systems and uninterruptible power supplies.

And

Essential Performance Capability (EPC) classified as ’critical’:

- EPC 10 – Demonstrate an understanding of the fundamental safety principles of AS/NZS 3000 Part 1. Knowledge of hierarchy of standards. Nomative/informative text.
- EPC 31 – Demonstrate the knowledge and skill to perform effective isolation of any equipment, including switch and lock off, circuit isolation, equipment testing and tag out procedures, including capacitor banks.
- EPC 43 – Demonstrate understanding of the requirements for personal safety in the workplace and application of safety practices.

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Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering

Competency Field

Work health and safety

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Follow WHS systems and procedures	1.1 Follow standard operating procedures (SOPs)
	1.2 Comply with WHS requirements at all times, including appropriate risk control measures
	1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4 Identify job requirements from specifications, drawings, job sheets or work instructions
	1.5 Isolate and tag circuits and equipment in accordance with procedures, where required
	1.6 Ensure all tools and equipment are checked for safety in accordance with procedures and regulatory requirements
	1.7 Follow established safety rules before beginning work on electrical wiring and equipment
	1.8 Determine and implement the level of supervision required appropriate to the type of electrical work and the level of the apprentice's and/or trainee's training
	1.9 Follow safe work procedures when working at heights

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			and in confined spaces
2.	Perform emergency first aid	2.1	Assess situation to identify points of danger to the injured person and potential rescuer
		2.2	Rescue/recover injured person or provide assistance to injured person in accordance with recognised standards/procedures
		2.3	Make contact with the appropriate medical and rescue authorities
		2.4	Record details of first aid given
3.	Identify codes of practice, standards and organisations that have an impact on the work of licensed electricians	3.1	Identify the codes of practice that apply to work carried out by licensed electricians
		3.2	Apply the fundamental safety procedures as outlined in AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) Part 1
		3.3	Identify the other relevant standards that apply to work carried out by licensed electricians
		3.4	Identify other regulatory requirements that apply to work carried by licensed electricians
		3.5	Identify reference compliance standards for electricity generation systems and electricity converters
		3.6	Identify organisations that have an impact on the roles and responsibilities of licensed electricians

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory requirements include:

- AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions
- AS/NZS 3017:2007 Electrical installations – Verification guidelines
- AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- Electrical Safety Act (various states/territories)
- electrical regulations (various states/territories)
- local service rules
- the Building Code of Australia

Compliance standards include:

- AS/NZS 4777:2005 (series), Grid connected inverter systems
- AS/NZS 5033:2014 Installation and safety requirements for photovoltaic (PV) arrays
- AS/NZS 3010:2005 Electrical installations – Generating sets
- AS/NZS 4509 (series), Stand-alone power systems
- AS 3011.1:1992 Electrical installations – Secondary batteries installed in buildings

Organisations include:

- Electrical Regulatory Authorities Council (ERAC)
- Electrical Safety Office or equivalent (various states/territories)
- Electrical Contractor Association or equivalent (various states/territories)
- energy supply authorities
- local TAFE

Safe working practices include:

- demonstration of safe working practices and installation in accordance with industry established safe and sound practices

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Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

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Assessment Requirements for MEM13017 Apply safety practices, procedures and compliance standards associated with licensed electrical work

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- preparing a safe work method statement (SWMS) or job safety analysis (JSA) in the absence of established procedures for effective isolation
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring, including capacitor banks
- ensuring all electrical equipment and tools are tested and tagged and up to date
- supervising all electrical apprentices and trainees to the level determined by their training and competence
- working safely at heights and in confined spaces
- applying procedures for movement/treatment of injured, including:
  - safe rescue of victim from a live situation
  - clearing of airways
  - cardio-pulmonary resuscitation (CPR)
  - care of spinal injuries
  - treatment of cuts/lesions
  - treatment of burns/scalds
  - treatment of shock
- accessing and using other relevant standards associated with electrical installation work
- accessing and abiding by codes of practice and other regulatory requirements
- contacting (when appropriate) organisations for guidance and assistance.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- typical hazards and risks in an electrical installation, including:
  - effects on the human body of various levels of alternating current (AC) and direct current (DC) and duration of current flow for various current paths
  - risk of ignition of flammable materials due to the thermal effects of current or electric arcs in normal service of an electrical installation
  - risk of injury from mechanical movement of electrical actuated equipment
  - protection from direct contact (basic protection)
  - acceptable methods
  - use of extra-low voltage (ELV)
- procedures and principles used to control risks associated with these hazards, including:
  - the development of a work health and safety (WHS) policy
  - consultation with everyone involved in the workplace
  - providing information training
  - identifying and assessing hazards
  - implementing and following risk control measures
  - maintaining and improving the WHS program
- approved lock out and tag procedures, including:
  - purpose and use of SWMS or JSA
  - reasons for isolation
  - lock-off equipment and signage
  - tools and equipment to prove electrical isolation of circuit/installation/system including capacitor banks is dead
- testing and tagging guidelines for electrical equipment and tools in accordance with AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- level of supervision required by electrical apprentices and trainees
- safe use of ladders and elevated work platforms, and working at heights
- working in confined spaces, including the following:
  - identification of the hazards
  - assessing the risks
  - controlling the risks
  - emergency procedures
- workplace emergency procedures, including appropriate methods of rescue:
  - removal of the victim of electric shock, including live switchboard rescue from live low voltage conductors
  - release from contact with live high voltage conductors (no attempt should be made until circuit has been switched off)
  - risks associated with fallen distribution lines and the associated voltage gradients

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- other points of danger, including:
  - fire
  - traffic
  - risks including chemicals
  - possibility of falls
- life support – CPR procedures, including duty of care
- appropriate use of fire extinguishers for given types of fires
- using carbon dioxide or dry chemical powder to fight electrical fires
- appropriate local medical and rescue services
- recording of first aid delivered

- codes of practice and regulatory requirements, including:
  - Electrical Safety Act or equivalent
  - Electrical Regulations or equivalent
  - Service Rules provided by local electricity distributors
  - Building Code of Australia
- AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) Part 1 – Scope, application and fundamental principles in regards to the following:
  - scope and application
  - referenced documents
  - definitions
  - alterations, additions and repairs
  - alternative arrangements
  - protection for safety, including:
    - against both direct and indirect contact by use of ELV
    - against direct and indirect contact
    - use of residual current devices (RCDs)
    - thermal effects in normal service
    - unwanted voltages
    - over-current and fault currents
    - over-voltage
    - injury from mechanical movement
    - devices for isolation
    - fire integrity
  - design of an electrical installation, including:
    - protection, functioning and compatibility
    - supply characteristics
    - maximum demand
    - voltage drop
    - electrical installation circuit arrangements
    - external influences

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- selection of electrical equipment, including:
  - safety requirements
  - external influences
  - adverse effects and interference
  - evidence of compliance
- installation of electrical equipment, including:
  - safe and sound practice
  - accessibility
  - information and identification
  - segregation
- inspection and testing, including:
  - visual inspection
  - continuity of earthing system
  - insulation resistance
  - polarity
  - correct circuit connections
- knowledge of hierarchy of standards
- normative/informative text
- other relevant standards associated with electrical installation work and testing and tagging of electrical equipment and tools
- Australian/New Zealand Wiring Rules requirements for electricity generation systems installation and electricity converters
- reference compliance standards, including:
  - AS/NZS 4777 (series), Grid connected inverter systems
  - AS/NZS 5033:2014 Installation and safety requirements for photovoltaic (PV) arrays
  - AS/NZS 3010:2005 Electrical installations – Generating sets
  - AS/NZS 4509 (series), Stand-alone power systems
  - AS 3011.1:1992 Electrical installations – Secondary batteries installed in buildings
- fundamental requirements of electricity generating systems, including:
  - DC polarity, including switching and protection devices
  - inverter principles
  - safe isolation and testing of systems
  - arrangement for connecting an alternative supply to an installation
  - earthing arrangements
- battery storage systems and requirements
- uninterruptible power supplies
- organisations that can have an impact of the role of the licensed electrician.

Assessment Conditions

- Assessors must:

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  - have vocational competency in applying safety practices, procedures and compliance standards associated with licensed electrical work at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM14001 Schedule material deliveries

Modification History

Release 1. Supersedes and is equivalent to MEM14001B Schedule material deliveries

Application

This unit of competency defines the skills and knowledge required to identify material requirements and schedule material delivery and applies to the estimating, planning and scheduling of material deliveries so that materials are available to the specifications and quantities required.

This unit is not intended to be used by personnel carrying out maintenance and installation.

Where scheduling is based on engineering drawings and supporting engineering data, appropriate units of competence should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Planning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine material requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify materials required from appropriate documentation, including type and quality
		1.4	Estimate quantities required in accordance with requirements
2	**Schedule material delivery**	2.1	Determine delivery requirements and dates from production plans or job sequencing requirements
		2.2	Follow up material supply and report problems
		2.3	Process material orders in accordance with established organisational practice and SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate documentation includes one (1) or more of the following:	• bills of materials • parts lists • catalogues • service manuals • engineering drawings

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM14001B Schedule material deliveries

Links

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Assessment Requirements for MEM14001 Schedule material deliveries

Modification History

Release 1. Supersedes and is equivalent to MEM14001B Schedule material deliveries

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying type and quantity of materials required from appropriate documentation
- scheduling material delivery in accordance with established organisational practices and procedures and following up any material or supply problems
- processing orders onto proformas and standard workplace forms in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- identification of material specifications from appropriate documentation
- established organisational practice and procedures relating to estimating, ordering and follow up of materials
- interpretation of production plans, or job sequencing requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in scheduling material deliveries at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM14002 Undertake basic process planning

Modification History

Release 1. Supersedes and is equivalent to MEM14002B Undertake basic process planning

Application

This unit of competency defines the skills and knowledge required to review process specifications and determine the production sequence and applies to one of a range of processes in manufacturing: machining, pressing, assembly and to a stage of the overall production process.

It does not apply to interfacing between processes.

Where planning is based on engineering drawings and supporting engineering data, appropriate units of competence should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Planning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Examine supporting engineering and production data, as required
		1.4	Determine the production processes to be used
		1.5	Obtain and examine specifications
2	**Determine production sequence**	2.1	Identify steps required for the process and produce flow charts in accordance with SOPs, as required
		2.2	Prepare material and parts lists
		2.3	Document tooling and/or equipment requirements
		2.4	Identify quality assurance steps and specifications and incorporate into process steps
		2.5	Document process steps and clearly represent

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM14002B Undertake basic process planning

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM14002 Undertake basic process planning

Modification History

Release 1. Supersedes and is equivalent to MEM14002B Undertake basic process planning

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering and production data and determining production processes, including work planned over a specified timeframe, taking into account required and available resources
- identifying steps and milestones against which progress can be checked and preparing flow charts in accordance with procedures
- preparing material and parts lists and documenting tooling and/or equipment requirements in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- production processes found within the organisation
- tooling and/or equipment requirements for workplace processes
- quality assurance requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking basic process planning at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM14003 Undertake production scheduling

Modification History

Release 1. Supersedes and is equivalent to MEM14003B Undertake basic production scheduling

Application

This unit of competency defines the skills and knowledge required to identify production requirements and capacities and prepare schedules for production of a component/part.

It applies to the scheduling of the manufacture of a single component, a single assembly function, a single small production work unit or production cell, or a single production process, where there are only a small number of constraints or variables.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Planning

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	production requirements and capabilities	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify and obtain engineering production data in accordance with workplace procedures
		1.4	Identify and obtain inventory capacities and requirements in accordance with SOPs
		1.5	Identify and obtain procurement and supply requirements and constraints in accordance with SOPs
		1.6	Identify and obtain production capacity and constraints in accordance with SOPs
		1.7	Identify and obtain standard times in accordance with SOPs
2	**Prepare schedule for production of a component/part**	2.1	Use a project management tool to prepare a production schedule for components/parts
		2.2	Document schedule in accordance with accepted SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Production schedules are prepared in accordance with one (1) or more of	• production • inventory • procurements

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

the following:

- time constraints
- supply capacities
- requirements

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM14003B Undertake basic production scheduling

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM14003 Undertake production scheduling

Modification History

Release 1. Supersedes and is equivalent to MEM14003B Undertake basic production scheduling

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting production process data and procedures to identify production requirements and capacities
- using a project management tool to develop a Gantt chart, or similar graphical display to depict the production schedule, to schedule production of components/parts
- undertaking numerical and mathematical calculations, as required
- documenting schedule in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- scheduling techniques
- production methods
- quality assurance requirements
- inventory policies
- procurement, supply requirements and constraints
- general staffing levels, capabilities and application of standard times
- machine set-up, capability and application of standard times
- enterprise safety requirements and directives.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking production scheduling at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM14006 Plan work activities

Modification History

Release 1. Supersedes and is equivalent to MEM14005A Plan a complete activity

Application

This unit of competency covers the skills and knowledge required to plan familiar work activities, whilst following established procedures and work health and safety (WHS) policies and procedures of the organisation.

Planning is undertaken by the individual performing the work. Individual plan components may require modification and prioritising to meet job requirements or to respond to unforeseen circumstances.

Where computations are required to be performed unit MEM12024 Perform computations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Planning

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Identify outcomes and objectives and clarify with appropriate persons
		1.3	Obtain and clarify relevant specifications and procedures
		1.4	Identify and prioritise individual components of the plan
		1.5	Select and use planning tools and techniques according to the requirements of the work
		1.6	Check the plan for accuracy and relevancy to job requirements
2	**Modify plan components**	2.1	Modify the plan components, as necessary, to respond to unforeseen developments
		2.2	Review the outcome of the work activity and, where necessary, identify future improvements to the plan
3	**Follow WHS requirements**	3.1	Comply with WHS requirements at all times
		3.2	Identify WHS hazards and risks and implement appropriate risk control measures in accordance with SOPs
		3.3	Select, use and maintain appropriate personal protective equipment (PPE) in accordance with SOPs
		3.4	Raise WHS issues with designated personnel in accordance with SOPs
		3.5	Report WHS related actions and incidents according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Plan components include one (1) or more of the following:	• resources • tools and equipment • materials and parts • overall timeframe • job history • quality requirements • criteria for acceptable completion • checks and tests • outcome and performance requirements • WHS requirements
Specifications include one (1) or more of the following:	• task lists • instructions • manufacturer manuals • diagrams and schematics • technical drawings and sketches • parts lists • computer records
Planning techniques and tools include one (1) or more of the following:	• scheduling • time management • brainstorming • setting goals and defined outcomes • prioritising • review and evaluation strategies
Risk control measures	• eliminate the hazard

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:

- substitute the hazard with a safer alternative
- isolate the hazard
- use engineering controls to reduce the risk
- use training to reduce the risk
- use PPE

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM14005A Plan a complete activity

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM14006 Plan work activities

Modification History

Release 1. Supersedes and is equivalent to MEM14005A Plan a complete activity

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning a work activity using appropriate planning tools and techniques whilst following established procedures, including work health and safety (WHS) requirements
- checking the plan to ensure accuracy and conformance and modifying the plan components, as necessary, to overcome any unforeseen difficulties or developments
- identifying hazards and implementing appropriate risk control measures and procedures
- selecting, using and maintaining relevant personal protective equipment (PPE)
- evaluating the effectiveness of risk controls measures
- providing proforma WHS reports in accordance with SOPs, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- relevant specifications
- sources of advice relating to the objectives, requirements and specifications
- timeframe for activity completion
- quality requirements of the product or service
- techniques and reasons for prioritising of each step in a plan
- modifications that can be made to the plan to respond to unforeseen developments
- risk control measures
- reporting requirements for accidents, incidents and other non-conformances with WHS procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in planning work activities in a manufacturing and engineering environment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15001 Perform basic statistical quality control

Modification History

Release 1. Supersedes and is equivalent to MEM15001B Perform basic statistical quality control

Application

This unit of competency defines the skills and knowledge required to take samples and apply a statistical process to monitor production and applies to the collation and interpretation of statistical data in the context of statistical quality control.

When the production and interpretation of charts and graphs not dependent on knowledge and understanding of the implications for quality are required unit MEM12024 Perform computations should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, plans, job sheets or work instructions
2	**Take samples**	2.1	Interpret the difference between populations and apply various sampling schemes in accordance with SOPs
3	**Apply statistical process to monitor production**	3.1	Interpret the concept of variation in terms of average and spread and use data to produce relevant statistical information
		3.2	Interpret data and present information to appropriate authority according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Sampling schemes include one (1) or more	• agreed customer plans • acceptable quality level (AQL) plans • average outgoing quality Level (AOQL) plans

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

of the following:	• Shainin • Six Sigma

Relevant statistical information includes one (1) or more of the following:	• average
	• range and process control data
	• plotting of charts, including one or more of the following:
	  • line graphs
	  • run charts
	  • tally charts
	  • histograms
	  • control charts
	• random and assignable causes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15001B Perform basic statistical quality control

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15001 Perform basic statistical quality control

Modification History

Release 1. Supersedes and is equivalent to MEM15001B Perform basic statistical quality control

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans, charts, lists and other applicable reference documents
- applying statistical process control procedures in accordance with instructions to a given production process
- applying various sampling schemes in accordance with procedures
- producing relevant statistical information, as required
- presenting collated information including uncontrolled variations to relevant authority and completing records in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- difference between population and sample, and the concept of variation in terms of average and range, random and assignable causes
- numerical operations and statistical calculations/formulae within the scope of this unit
- statistical process control procedures the sampling procedures to be followed
- types of charts that can be produced to assist monitoring of products, including run charts, tally charts, histograms and control charts
- procedures for reporting sample data information.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing basic statistical quality control at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15003 Use improvement processes in team activities

Modification History

Release 1. Supersedes and is equivalent to MEM15003B Use improvement processes in team activities

Application

This unit of competency defines the skills and knowledge required to identify improvements and/or solve problems, implement/monitor the employment of an improvement strategy and evaluate the improvement. It applies to quality circle participation using problem-solving techniques.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Quality

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Identify areas for improvement and/or solve problems**	2.1	Use teamwork to select improvement tools and methods appropriate to the situation
		2.2	Use teamwork to process improvement tools to identify improvements and/or solve problems
3	**Implement and monitor improvement strategy**	3.1	Use teamwork to implement improvement strategies in accordance with SOPs, as required
		3.2	Recommend further action in conjunction with work team, as required
		3.3	Monitor performance for change, utilising feedback data
4	**Evaluate improvement**	4.1	Use analytical tools to evaluate improvement, as required
		4.2	Recommend further action in conjunction with work team using SOPs, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Improvement tools and methods include one (1) or more of the following:	• flow charts • cause and effect diagrams • Pareto charts • histograms • run charts and graphs • control charts • scattergrams
Improvement strategies include one (1) or more of the following:	• Plan, Do, Check, Act (PDCA) procedures • Six Sigma techniques • root cause analysis

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15003B Use improvement processes in team activities

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15003 Use improvement processes in team activities

Modification History

Release 1. Supersedes and is equivalent to MEM15003B Use improvement processes in team activities

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents
- participating and communicating in a team setting and identifying improvements and/or solving problems using improvement tools and methods
- implementing improvement strategies
- recommending further action, as required
- completing all reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices
- roles and functions of self and team members
- team discussion and problem-solving processes
- improvement tools and methods and their application
- procedures for using process improvement tools in the team environment
- improvement strategies
- procedures for implementing the improvement strategies
- individual's role in implementing improvement strategies
- procedures for initiating further action
- procedures for collecting and collating improvement feedback data
- analytical tools and processes to evaluate the improvement.

Assessment Conditions

- Assessors must:

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  - have vocational competency in using improvement processes in team activities at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15004 Perform inspection

Modification History

Release 1. Supersedes and is equivalent to MEM15004B Perform inspection

Application

This unit of competency defines the skills and knowledge required to inspect products, keep records and provide feedback on the conformance of product to specifications and applies to inspection of completed or partly completed products produced by others. It applies to a range of manufacturing enterprises and requires application of a range of measuring equipment/devices/ tools.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

This unit is not intended to be applied to maintenance personnel carrying out their day-to-day activities, for example, fault finding, remedial and checking activities. These skills are covered by other units such as unit MEM18006 Perform precision fitting of engineering components.

This unit should not be selected for the purposes of non-destructive testing where any of the following units have already been selected:

- MEM24002B Perform penetrant testing
- MEM24004B Perform magnetic particle testing
- MEM24006B Perform eddy current testing
- MEM24008B Perform ultrasonic testing
- MEM24010B Perform radiographic testing

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Inspect products**	2.1	Test products for conformance to specifications in accordance with SOPs
		2.2	Mark test status on conforming and non-conforming products and ensure records are accurately kept using SOPs
3	**Provide feedback**	3.1	Test/inspect/measure products after rework or repair
		3.2	Report deficiencies or deviations according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Inspection includes one (1) or more of the following:	• 'first piece inspection' • fixed interval • sample
Tested for conformance to specifications includes one (1) or more of the following:	• visual inspection • physical measurements • chemical tests • checks for patterns • templates • guides

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15004B Perform inspection

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15004 Perform inspection

Modification History

Release 1. Supersedes and is equivalent to MEM15004B Perform inspection

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents
- testing products for conformance to specifications using appropriate testing methods
- testing reworked/repaired products for conformance to specifications
- completing all reports/records in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures as defined by job instructions to be used to check conformance to specifications
- data to be recorded and the frequency of recording required
- consequences of not keeping accurate records
- non-conformances of given products that can be removed by rework/repair in accordance with job instructions.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing inspection at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15005 Select and control inspection processes and procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15005B Select and control inspection processes and procedures

Application

This unit of competency defines the skills and knowledge required to select inspection and test procedures to inspect products for conformance to specifications and control the inspection/test environment and equipment. It applies to a range of manufacturing enterprises where inspection involves working autonomously and taking responsibility for overseeing inspection process and environment.

This person would use a wide range of equipment/instruments and take responsibility for the reliability of inspection results to ensure conformance to specifications.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, as appropriate should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM15004	Perform inspection
MEM16006	Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select inspection/test procedures**	2.1	Select appropriate methods of inspection and implement
		2.2	Monitor inspection/test procedures to ensure desired outcomes
3	**Control inspection/test environment and equipment**	3.1	Monitor environmental conditions to ensure reliability of tests and results
		3.2	Check equipment/instruments for correct calibration
		3.3	Initiate calibration of equipment/instruments, as required
		3.4	Check validity of previous results if equipment/instruments are found to be out of calibration, and report according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15005B Select and control inspection processes and procedures

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15005 Select and control inspection processes and procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15005B Select and control inspection processes and procedures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents
- implementing and monitoring inspection/test procedures to ensure desired outcomes are achieved
- checking calibration of measuring equipment/instruments and initiating calibration against the appropriate standard, as required
- detecting and reporting out-of-calibration equipment in accordance with procedures
- applying units of measurement and numerical operations and calculations in selecting and controlling inspection processes and procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- range of inspection methods and their application
- appropriate inspection method for the process/product and procedures for implementing inspection methods
- desired/target outcomes of the inspection/test procedures and reasons for any discrepancies/trends
- procedures for monitoring inspection/test procedures
- effects of environmental conditions on test equipment and the results and procedures for monitoring environmental conditions
- acceptable range of variations to environmental conditions
- specifications and correct operation of the measuring equipment
- procedures for checking the calibration of the measuring equipment
- appropriate techniques, tools and equipment to measure components
- units of measurement and numerical operations/calculations within the scope of this unit

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- codes, standards, legislative or regulatory requirements applicable to the measuring equipment and/or calibration
- procedures for initiating the calibration of measuring equipment
- physical reference standard against which the measuring equipment is to be calibrated
- procedures for recording calibration details and reasons for keeping calibration records
- procedures to be followed when measuring equipment is found to be out-of-calibration and reasons for checking results from out-of-calibration measuring equipment
- procedures for reporting out-of-calibration measuring equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and controlling inspection processes and procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15007 Conduct product and/or process capability studies

Modification History

Release 1. Supersedes and is equivalent to MEM15007B Conduct product and/or process capability studies

Application

This unit of competency defines the skills and knowledge required to conduct process capability studies, set control limits and select sampling plans and applies to the analysis of data from a production section or processes using appropriate statistical techniques.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of manual handling is required unit MEM11011 Undertake manual handling should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

MEM12024	Perform computations
MEM12025	Use graphical techniques and perform simple statistical computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM15001	Perform basic statistical quality control
MEM15008	Perform advanced statistical quality control
MEM16006	Organise and communicate information

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Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Consult with production or process personnel within the enterprise's total quality plan about conducting studies
2	**Conduct process capability studies**	2.1	Determine procedure for conducting capability study
		2.2	Prepare instructions for personnel conducting trial run
		2.3	Analyse data from trial run and calculate the process capability
		2.4	Estimate possible number of product defects from a particular process
		2.5	Determine optimum target mean to suit process capability data
		2.6	Prepare reports listing various options from process capability studies
		2.7	Recommend design specifications based on an analysis of data
3	**Set control limits**	3.1	Calculate control limits for sample/subgroup average, range and standard deviation

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.2	Calculate warning limits for subgroup average, range and standard deviation
	3.3	Determine course of action resulting from out-of-control situation and document according to SOPs
4 **Select sampling plans**	4.1	Select appropriate sampling plan to suit production schedule and determine acceptable quality limits, taking into account specified producer and consumer risks
	4.2	Document sampling plan, including implementation strategy

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Procedure includes the following:	• frequency of sample and sample size
Data includes the following:	• periodic samples drawn from a trial run of the process
Process capability includes the following:	• the natural tolerance of the process which may be calculated at 3 sigma/standard deviations
Product defects include	• from a consideration of 3 or 6 sigma standard deviations

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

the following:	compared to specification requirements
Various options include one (1) or more of the following:	• adjustment of process to move average • improvements to reduce process capability • changes to reduce assignable causes
Appropriate sampling plan includes one (1) or more of the following:	• plans within the adopted quality system • sample size • frequency of sample

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15007B Conduct product and/or process capability studies

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15007 Conduct product and/or process capability studies

Modification History

Release 1. Supersedes and is equivalent to MEM15007B Conduct product and/or process capability studies

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining procedure for conducting capability study
- analysing data, identifying solutions and developing recommendations
- estimating the possible number of defects compared to the specification requirements
- preparing reports listing the various options
- determining process design specifications from process capability data
- selecting appropriate sampling plan
- documenting sampling plan and implementation strategy in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- process to be studied
- procedures for conducting process capability studies
- data used to calculate the process capability
- procedures for estimating the possible number of product defects
- options for improving the process and benefits of each
- procedures for determining the optimum target mean
- numerical operations and calculations/formulae for process capability, control limits and other outcomes within the scope of this unit
- procedures for setting control and warning limits
- concept of out-of-control situations
- action to be taken when an out-of-control situation is detected and procedures for documenting out-of-control situations
- acceptable level of quality
- variety of sampling plans and their application

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- sampling plan to be applied to a given situation and reasons for selection
- acceptable quality limits
- risks associated with identifying acceptable quality limits for the producer and customer
- procedures for documenting and implementing sampling plans.

Assessment Conditions

- Assessors must:
  - have vocational competency in conducting product and/or process capability studies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15008 Perform advanced statistical quality control

Modification History

Release 1. Supersedes and is equivalent to MEM15008B Perform advanced statistical quality control

Application

This unit of competency defines the skills and knowledge required to construct control charts and involves the understanding of statistical processes and the application of these processes to the maintenance and improvement of a quality system.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM12024	Perform computations
MEM12025	Use graphical techniques and perform simple statistical computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM15001	Perform basic statistical quality control
MEM16006	Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Determine the key product parameters to be controlled
2	**Construct control charts**	2.1	Complete control charts/proformas, including the determination of control limits from sample data following workplace procedures
		2.2	Measure and describe population dispersion using 1, 2 and 3 sigma limits as required
		2.3	Interpret control charts and apply the results to quality/improvements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Product parameters include one (1) or more of the following:	• dimensions • weights • voltages • temperatures • speeds

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control charts/proformas include one (1) or more of the following:	• Shewart charts • charts for process average • range • attributes
Sample data includes the following:	• periodic samples drawn from a trial run of the process

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15008B Perform advanced statistical quality control

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15008 Perform advanced statistical quality control

Modification History

Release 1. Supersedes and is equivalent to MEM15008B Perform advanced statistical quality control

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining the product parameters to be controlled from a given specification
- constructing control charts/proformas following workplace procedures
- interpreting control charts and applying the results to quality/improvements
- calculating the population dispersion for given data in terms of 1, 2 and 3 sigma limits.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- control charts and their application to quality/improvements
- statistical process control procedures
- procedures for constructing control charts and determining control limits from sample data
- population dispersion in terms of 1, 2 and 3 sigma limits.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced statistical quality control at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15010 Perform laboratory procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15010B Perform laboratory procedures

Application

This unit of competency defines the skills and knowledge required to work under laboratory conditions, perform calibration of equipment and write reports on the results. It applies to the use of a range of sophisticated equipment that provides independent feedback on quality processes and procedures.

Calibration refers to those calibrations which are conducted to a specified standard using equipment available in the workplace/laboratory. It can include the testing of known standard samples.

This unit would be taken in conjunction with appropriate technical units.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, drawings, circuits, job sheets or work instructions
2	**Work under laboratory conditions and perform calibration**	2.1	Conduct independent tests under controlled conditions
		2.2	Verify and calibrate equipment to agreed quality standards
		2.3	Safeguard calibration status against unauthorised adjustment
		2.4	Keep accurate records for reference purposes
		2.5	Recall test equipment periodically for adjustment, repair and re-calibration
		2.6	Maintain documentary evidence to satisfy the requirements of the certifying body or as specified by the calibration standards or the manufacturer’s recommendations
		2.7	Trace calibration of known accuracy to national or international reference standards or, where these do not exist, set calibration to specifically developed criteria

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tests will be conducted to a standard and include one (1) or more of the following:	• mechanical tests including for hardness, tensile and impact • electrical tests including for resistance, capacitance and inductance • semiconductor or other electronic tests
Test equipment includes one (1) or more of the following:	• mechanical • electrical • electronic • some combination

Documentary evidence includes one (1) or more of the following:	• identification of equipment
	• frequency of re-calibration
	• calibration status
	• procedures for:
	  • recall
	  • handling and storage
	  • adjustment
	  • repair
	  • calibration
	  • installation and use

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15010B Perform laboratory procedures

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Assessment Requirements for MEM15010 Perform laboratory procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15010B Perform laboratory procedures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting relevant drawings, circuits, specifications, instructions and data
- conducting independent tests to a standard method under controlled conditions
- checking measuring equipment for correct calibration against agreed quality standards
- safeguarding the calibration status of the equipment against unauthorised adjustment
- recalling test equipment for adjustment, repair and re-calibration and using reference standards or specific criteria as a basis for calibration
- completing and maintaining records of measuring equipment calibrated and preparing reports on the tests carried out.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- tests and conditions under which they are to be undertaken
- testing procedures to be followed and the reasons for conducting tests under controlled conditions and the need for tests to be conducted independently
- quality standards against which the measuring equipment is to be calibrated
- specifications and correct operation of the measuring equipment
- tools and equipment required to check the calibration of the measuring equipment
- procedures for checking the calibration of the measuring equipment
- any codes, standards, legislative or regulatory requirements applicable to the measuring equipment and/or calibration
- procedures for preventing unauthorised adjustment of equipment and the reasons for protecting equipment against unauthorised adjustment
- records to be kept with respect to the calibration of measuring equipment and the reasons for keeping accurate calibration records

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- procedures for recalling test equipment for adjustment, repair and re-calibration and the frequency of test equipment recall and reasons why test equipment can be recalled
- all relevant documentation relating to the calibration/re-calibration of test equipment and procedures for completion
- sources of reference standards and procedures to be used in the absence of reference standards
- reports to be prepared/provided with respect to the test equipment being tested and the procedures for preparing/ providing reports on tests carried out on test equipment
- auditing processes to be applied to testing procedures
- use of information from the inspections, tests and audits conducted in the development of design and servicing of products/equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing laboratory procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15011 Exercise external quality assurance

Modification History

Release 1. Supersedes and is equivalent to MEM15011B Exercise external quality assurance

Application

This unit of competency defines the skills and knowledge required to liaise with external suppliers, check for conformance to specifications, assess the external suppliers and evaluate their goods and/or services.

It applies to evaluating and communicating with a wide range of supplier enterprises to ensure that purchased supplies meet quality standards and that adequate documents are prepared and maintained to standard operating procedures.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM15004	Perform inspection
MEM15005	Select and control inspection processes and procedures

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MEM16006 Organise and communicate information

Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Communicate the exact quality requirements to suppliers
		1.5	Negotiate and agree on quality assurance
		1.6	Establish and agree on verification method and systems and procedures for dispute settlement
		1.7	Establish recording system of procured products or services which ensures traceability
2	**Check for conformance to specifications**	2.1	Obtain and interpret the requirements of all relevant documentation, including contract specifications, drawings and purchase orders
		2.2	Establish the conformance of the procured product or service to all of the documented requirements
3	**Assess external suppliers**	3.1	Conduct assessment and evaluation of suppliers' capability and/or quality system
		3.2	Evaluate suppliers' goods or services and report as required.

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Quality assurance system includes one (1) or more of the following:	• ISO 9000 procedures • Six Sigma procedures • sampling plans
Traceability includes the following:	• unique identification of individual product or batches as appropriate
Assessment and evaluation include one (1) or more of the following:	• vendor rating procedures • design reviews • audit reports • site surveillance reports • failure reports • concession applications

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15011B Exercise external quality assurance

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15011 Exercise external quality assurance

Modification History

Release 1. Supersedes and is equivalent to MEM15011B Exercise external quality assurance

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting relevant drawings, specifications, instructions and appropriate documentation
- negotiating and agreeing on a quality assurance system
- implementing a system for recording and tracing products or services procured
- checking products/materials or services provided for conformance to documented requirements/specifications
- assessing and evaluating supplier capability to provide the required product/material or service
- evaluating supplier quality systems and supplier goods or services
- reporting on assessment and evaluation of suppliers.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- exact quality requirements of the product/material to be supplied
- procedures to be followed to ensure the supplier understands the quality requirements
- requirements of a quality assurance system to ensure the supplied product/material conforms to the quality requirements
- procedures for negotiating agreements with suppliers
- procedures for verifying that the agreed quality assurance system is being utilised by the supplier
- techniques for dispute resolution
- procedures for recording procured products or services
- means and reasons for tracing procured products or services
- specifications of the product/material to be supplied or service to be provided
- variations from documented requirements/specifications

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- procedures for assessing/evaluating a supplier's capability to supply the required product/material or service
- procedures for evaluating a supplier's quality system
- procedures for evaluating a supplier's goods or services
- equipment and techniques required to carry out the evaluation procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in exercising external quality assurance at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM15012 Maintain/supervise the application of quality procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15012B Maintain/supervise the application of quality procedures

Application

This unit of competency defines the skills and knowledge required to improve the quality system, collect and summarise data to support the quality improvement process and use data to produce statistical information.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM12024	Perform computations
MEM12025	Use graphical techniques and perform simple statistical computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM15001	Perform basic statistical quality control
MEM16006	Organise and communicate information

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Competency Field

Quality

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Interpret specifications to meet customer needs (internal and external)
2	**Improve quality system**	2.1	Undertake leadership role as a supplier to ensure quality within the supply chain
		2.2	Record and interpret the collected data
		2.3	Use data to produce relevant statistical information

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer needs include one (1) or more of the	• product • service

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:	• delivery and distribution • quality • quantity • price • communication and documentation
Statistical information includes one (1) or more of the following:	• averages • ranges • tally charts • run charts • control charts

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM15012B Maintain/supervise the application of quality procedures

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM15012 Maintain/supervise the application of quality procedures

Modification History

Release 1. Supersedes and is equivalent to MEM15012B Maintain/supervise the application of quality procedures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting the specifications of the product or service to be provided
- communicating effectively with suppliers and customers and establishing their needs
- calculating relevant statistical information from collected data
- producing tally, run and control charts from collected data.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications to be achieved in providing the service or producing the product
- team's suppliers and customers
- possible effects of supplying products and/or services to customers that do not comply with specifications
- procedures to be followed in producing the product and/or supplying the service
- checks to be undertaken to ensure the product/service complies with specifications
- personnel responsible for the quality of the product/service provided
- actions to be taken when a non-conformance to specifications is detected and reasons for taking those actions
- procedures for recording data collected
- possible trends from the collected data and reasons for collecting data
- actual trends indicated by given samples of data
- statistical information to be calculated
- use of statistics in interpreting production data
- functions of tally, run or control charts in representing production data
- trends indicated by the statistical information calculated and/or the charts produced

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- action to be taken in response to any trends identified and reasons for taking proposed action
- appropriate techniques, tools and equipment to measure machined components.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining/supervising the application of quality procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM15015B Examine trading practices

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers examining trading practices relating to measurement employed by traders.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement inspection activities in public or private enterprises. This unit applies to the examination of sales made by reference to measurement. It does not apply to inspection of pre-packed articles. For inspection of pre-packed articles, Unit MEM15016B (Inspect pre-packed articles) should be selected. This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Band**: **A** **Unit Weight**: **5**

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		
Path 1	MEM12023A	Perform engineering measurements

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Explain the requirements of trade measurement legislation relating to trading practices	1.1. Legislation requirements that apply to trading practices are explained. 1.2. Policy guidelines that apply to trading practices are explained.
2. Inspect trading practices for compliance	2.1. Trading practice methods employed on premises are examined for compliance with legislative requirements. 2.2. Incidents of non-compliance in a range of trading environments are identified and, where appropriate, activities are undertaken to prove the breach of legislation.

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ELEMENT	PERFORMANCE CRITERIA
	2.3. Results of inspection are documented.
3. Finalise inspection and identify appropriate action	3.1. Trading practice information relevant to the inspection is communicated to the trader. 3.2. Appropriate actions to encourage compliance are determined and identified. 3.3. Inspection documentation is completed in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- applying relevant organisational policy and procedures in regard to trading practices
- examining methods utilised for advertising and the sale of goods employed on the premises for compliance with legislative requirements
- examining the manner in which a measuring instrument is used on the premises
- identifying incidents of non-compliance in a range of trading environments
- determining action to be undertaken based on the organisation's enforcement policy
- gathering sufficient and relevant evidence to prove a breach
- accurately recording information
- advising on appropriate trading practices to assist compliance
- undertaking observation and surveillance in relation to trading practices
- explaining legislative requirements and obligations
- completing notices accurately in accordance with organisational guidelines
- planning follow-up activities as required
- accurately recording results of the inspection and recommendations in the organisation's information files
- completing breach reports in accordance with organisational guidelines

Required knowledge

Look for evidence that confirms knowledge of:

- definition of the term 'trading practices'

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REQUIRED SKILLS AND KNOWLEDGE
• relevant policy and procedures across a range of trading environments • legislation relating to trading practices • the range of trading environments • trading practices relevant to a range of business types • processes for evidence collection and evidence handling • specific reporting procedures • techniques to liaise with traders • legislative requirements and obligations for the issuing of notices • organisation's policy guidelines for return visits • specific reporting procedures • types of evidence

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to examine trading practices involving measurement employed by traders. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

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EVIDENCE GUIDE	
	This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with examining trading practices employed by traders, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation requirements and policy guidelines	Enabling legislation, organisational procedures and policies - workplace, health and safety, enforcement policies
Trading practices	Methods of sale of goods, advertising, use of measuring instrument, position of measuring instruments, misrepresentations, environmental factors, suitability of instrument, over-pricing,

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RANGE STATEMENT	
	incorrect measurement
Premises	Supermarkets, fruit and vegetables retailers, packing house, meat, seafood and smallgoods, bakery, etc.
Examination for compliance	Observation, trial purchase, questioning, reviewing records
Activities used to prove a breach of legislation	Trial purchases, observation/surveillance, photographs, seizure of documentations, articles, measuring instruments, testing the measuring instruments
Appropriate actions to encourage compliance	Warning letter, non-compliance notice, infringement notice, prosecution

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15016B Inspect pre-packed articles

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit cover performing trade measurement inspection activities in trading environments. The unit covers the competency required to undertake examination of pre-packed articles in relation to measurement.

Application of the Unit

Application of the unit	This unit applies to the inspection of articles intended for sale as pre-packed articles for compliance with legislative requirements. Applies to goods sold or intended for sale in any location regardless of place of packing. This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Band**: **A** **Unit Weight**: **8**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Prerequisite units		
Path 1	MEM13003B	Work safely with industrial chemicals and materials

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Explain the requirements of trade measurement legislation relating to pre-packed articles	1.1. Legislative requirements that apply to pre-packed articles are explained. 1.2. Approved markings as they apply to all pre-packed articles intended for sale are described.
2. Inspect pre-packed articles for compliance with marking requirements	2.1. Pre-packed articles are examined for the marking of quantity statements and unit pricing in accordance with legislative requirements. 2.2. Pre-packed articles are examined for the marking of packer identification. 2.3. Results of examination are documented for further action.

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ELEMENT	PERFORMANCE CRITERIA
3. Measure pre-packed articles	3.1. Articles are selected for check measuring in accordance with marketplace intelligence, legislative requirements and organisational procedures. 3.2. Product handling and disposal requirements are assessed and complied with in accordance with workplace, health and safety requirements, environmental considerations and public sector auditor's requirements. 3.3. Specialised equipment and measuring devices are selected in accordance with organisational procedures. 3.4. Articles are check measured in accordance with organisation's procedures to determine compliance with legislation. 3.5. Results of check measurements are documented for further action.
4. Finalise inspection and take appropriate action	4.1. Trading practice information relevant to the inspection is communicated to the trader. 4.2. Approved procedures to remedy non-compliance are determined and applied, 4.3. Inspection documentation is completed in accordance with organisational procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- applying relevant sections of the legislation to pre-packed articles
- measuring pre-packed articles
- assessing quantity and unit pricing statements, for compliance with legislation
- comparing marking of packer identification, against legislation
- recording marking non-compliance accurately for further action
- interpreting marketplace intelligence
- safely handling and disposing of products in relation to measuring pre-packed

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REQUIRED SKILLS AND KNOWLEDGE
articles • documenting check-measurement results and non-compliances in accordance with organisational guidelines • checking the accuracy and suitability of the measuring devices • discussing trader's enquiries and concerns • explaining legislative requirements to traders • completing legal documentation • planning follow-up activities • recording results of the inspection accurately in organisation's information files • making clear and accurate recommendations
Required knowledge
Look for evidence that confirms knowledge of: • definition of 'pre-packed articles' • relevant sections of legislation across a range of pre-packed articles • the range of packing types • quantity statement or measurement marking form, size and position • pre-packed articles exempted from the requirements of legislation • all symbols for units of measurement • application of qualifying statements • pre-packed articles exempted from marking packer identification • how to identify origin of packing • marketplace intelligence, legislative requirements and organisational procedures in relation to selecting pre-packed articles • the impact of environmental factors on pre-packed articles • use of protective clothing and equipment • checking of hazardous product data sheet • the organisation's policy and procedures • the accuracy and suitability of the measuring devices used to check pre-packed articles • procedures for determining the measurement method of pre-packed articles • the number of articles to check-measure in accordance with legislative requirements • methods of determining the tare weight of packages • responding to trader's enquiries • advising the trader • accurate wording of notices • legislative requirements and obligations for the issuing of notices • organisation's guidelines for return visits • specific reporting procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to inspect pre-packed articles. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with inspecting pre-packed articles, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be

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EVIDENCE GUIDE	
	permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation requirements and policy guidelines	Enabling legislation, organisational policies and procedures - workplace, health and safety, environmental legislation, enforcement policies, auditor's instructions
Workplace, **health and safety requirements**	Storage of test equipment, site/premise conditions, handling of dangerous materials, safety clothing, manual handling techniques, product disposal, transportation of test equipment
Environmental considerations	Disposal of hazardous materials, weather conditions, storage methods and conditions
Specialist equipment and measuring devices	Reference standards and test equipment, safety equipment, product handling equipment, measuring equipment
Inspection documentation	Organisational forms, notices, field books, product handling sheets, evaluation form or report

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Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15017B Use and maintain reference standards

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers caring for and maintaining reference standards and test equipment used to undertake trade measurement activities.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement inspection/certification activities in public or private enterprises. This unit may be applied in relation to inspection of pre-packed articles, examining trading practices, auditing servicing licensees, investigating consumer complaints, performing verification/certification and in-service inspection. Reference material relevant to this competency includes Australian standards, handbook of verifying authority, manufacturers' operating manuals, organisational procedures and quality assured manual. Workplace and health and safety considerations include storage and transportation of test equipment, handling of test equipment, handling of hazardous materials, safety clothing, manual handling techniques and site/premises conditions. **Band**: **B** **Unit Weight**: **3**

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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM11011B	Undertake manual handling
	MEM12003B	Perform precision mechanical measurement
	MEM12004B	Perform precision electrical/electronic measurement
	MEM12005B	Calibrate measuring equipment
	MEM12023A	Perform engineering measurements
	MEM18001C	Use hand tools
	MEM18002B	Use power tools/hand held operations

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the appropriate class of reference standard suitable to verify a range of trade measuring instruments	1.1. Tolerances required for reference standards are researched in relation to testing a range of trade measuring instruments and legislation. 1.2. The correct classes of reference standards are selected to test a range of trade measuring instruments.
2. Use reference standards and test equipment in a safe and metrologically sound manner	2.1. Standards Laboratory purpose and function are explained. 2.2. An operational assessment on reference standards and test equipment is performed prior to use. 2.3. Documented operating policies and procedures for reference standards and test equipment are accessed and followed. 2.4. Safety requirements for the use of reference standards and test equipment within the work environment are demonstrated.
3. Store and transport reference standards and test equipment to maintain their integrity	3.1. Specialised equipment and reference standards are stored in accordance with organisational procedures. 3.2. Specialised equipment and reference standards are transported in accordance with organisational procedures.
4. Perform required maintenance of reference standards and test equipment	4.1. Maintenance requirements of reference standards and test equipment are identified. 4.2. Regular maintenance of reference standards and test equipment is undertaken in accordance with maintenance register. 4.3. Defective reference standards and test equipment are identified and reported for repair.
5. Interpret documentation relating to the use of maintenance of reference standards and test equipment	5.1. Information contained in the certificate of verification is checked and compared with reference standards and test equipment being used. 5.2. Reference standards are used in accordance with documented instructions and certificates.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- accessing correct reference manuals for appropriate information concerning tolerances for reference standards
- identifying correct class of reference standard and matching with the appropriate trade measuring instrument
- accessing documented operating procedures for reference standards and test equipment
- using reference standards and test equipment
- calibrating/maintaining reference standards and test equipment
- maintaining maintenance register
- identifying and recording/reporting malfunction of or damage to reference standards or test equipment
- interpreting certificates of verification in relation to the use of reference standards
- using graphs and tables within certificates

Required knowledge

Look for evidence that confirms knowledge of:

- definition of 'legal metrology'
- the hierarchy of reference standards in relation to legal metrology
- Australian legal units of measurement used for trade
- the organisations involved in legal metrology in Australia
- application of different classes of reference standards used to test measuring instruments
- maintenance requirements for reference standards and test equipment
- major function and purpose of the Standards Laboratory
- the actions to be taken if reference standards and test equipment are found to be defective
- test equipment and reference standards storage specifications and procedures
- personal responsibility for workplace, health and safety requirements
- specialised equipment, reference standards and transport specifications and procedures
- transport specifications and procedures
- variations from storage specifications and procedures requiring appropriate approval
- variations from transport specifications and procedures requiring appropriate approval

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REQUIRED SKILLS AND KNOWLEDGE
• maintenance required for test equipment where manufacturers' requirements are unavailable • a range of maintenance and calibration procedures • procedure for reporting faults • action to be taken where legal traceability can not be confirmed • the purpose of certificates of verification issued under the national legislation • information in graphs and tables within certificates • workplace, health and safety requirements relating to reference standards and test equipment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to use and maintain reference standards. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated

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EVIDENCE GUIDE	
	with using and maintaining reference standards, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Reference standards	Mass, volume, density, area, length, master meters, temperature
Legislation	Enabling legislation, workplace, health and safety, environmental legislation
Operating policies and procedures	Manufacturers' specifications, industry guidelines, Australian standards, legislation, organisational procedures and guidelines
Specialised equipment	Reference standards, measuring devices, safety equipment

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RANGE STATEMENT	
Maintenance requirements of reference standards and test equipment	Cleaning and painting, electrical safety testing and tagging, continuity and pressure testing, manufacturers' service requirements

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15018B Investigate consumer complaints

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers the competency required to investigate consumer complaints in relation to measurement.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement inspection activities in trading environments. This unit applies to investigating consumer complaints such as those relating to pre-packed articles, use of measuring instruments, trading practices, servicing licensees and public weighbridges. Reference material includes uniform test procedures, international handbook, Australian standards and investigation method guidelines. Relevant workplace health and safety/environmental considerations are storage and transportation of test equipment, site/premises conditions, disposal of dangerous materials, storage of seized equipment/products, specific safety equipment and clothing, manual handling techniques, product handling equipment, and weather. **Band**: **B** **Unit Weight**: **6**

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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM11011B	Undertake manual handling
	MEM12023A	Perform engineering measurements
	MEM15004B	Perform inspection
	MEM15005B	Select and control inspection processes and procedures
	MEM15015C	Examine trading practices
	MEM15016B	Inspect pre-packed articles
	MEM16004B	Perform internal/external customer service
	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Receive and document the complaint	1.1. Allegations are recorded in accordance with organisational procedures. 1.2. Complaints are screened to ensure that they are relevant to trade measurement and are assessed to determine priority. 1.3. Complainant is advised of investigative process and timeframes for feedback.
2. Plan the investigation	2.1. The information received is assessed for possible breaches in relation to the legislation. 2.2. Trader history and complaint precedence is researched. 2.3. Suitable equipment and personnel are organised to undertake the investigation. 2.4. Enforcement policies and procedures are researched to ascertain appropriate action to be implemented.
3. Investigate the complaint	3.1. Preliminary investigation to gather prima facie evidence is conducted in accordance with organisational procedures. 3.2. Evidence is gathered to substantiate a breach in accordance with investigative practices. 3.3. The relevant components of a routine field inspection are conducted in accordance with organisational procedures.
4. Finalise the complaint investigation	4.1. Information relevant to the inspection is communicated to the trader. 4.2. Approved procedures to remedy non-compliance are determined and applied. 4.3. Inspection documentation is completed in accordance with organisational procedures.
5. Complete complaint file documentation	5.1. Complainant is advised of outcome of the investigation. 5.2. Complaint documentation is completed in accordance with organisational guidelines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- accurately recording complaint details
- prioritising complaints and other related activities
- researching and applying relevant legislation to the complaint investigation
- accessing and using organisational information systems
- identifying and organising suitable equipment and personnel
- briefing personnel concerning the requirements of the investigation
- accessing the organisation's enforcement policies and procedures
- establishing appropriate courses of action
- conducting surveillance of trading premises is conducted
- gathering information to verify the complainant's allegations
- gathering evidence to prove all elements of a breach
- using appropriate investigative techniques are used
- maintaining the integrity of evidence
- responding to traders' concerns
- discussing traders' enquiries and concerns.
- explaining legislative requirements and obligations to the trader
- completing notices in accordance with organisational guidelines
- planning follow-up activities
- recording results of the inspection accurately in organisation's information files
- completing breach reports in accordance with organisational guidelines
- communicating outcomes of the investigation to the complainant within specified organisational timeframes
- applying interpersonal communication and listening skills
- accurately recording results of the investigation in the complaint file

Required knowledge

Look for evidence that confirms knowledge of:

- the different methods of complaint lodgements
- organisational policy guidelines concerning complaints
- organisational guidelines in regard to timelines
- the equipment required to investigate a range of complaints
- the organisation's guidelines for the deployment of personnel
- the range of possible investigation activities available
- elements of offence

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REQUIRED SKILLS AND KNOWLEDGE
• available surveillance methods for a range of complaints and premises • the evidence required to prove a range of breaches of legislation • a range of investigation methods • the required procedures for the handling of evidence to maintain its integrity • the reasons for selecting relevant components of a routine field inspection • legislative requirements and obligations for the issuing of notices • organisation's policy guidelines for return visits • specific reporting procedures • complaint outcome classifications • complaint documentation procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to investigate consumer complaints. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, i.e. the candidate is not in productive work, an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication,

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EVIDENCE GUIDE	
	materials handling, recording and reporting associated with investigating consumer complaints, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisational procedures	Trial purchase, surveillance, witness statements, verification/in-service inspection procedures, pre-packed articles inspection procedures, trading practices inspection procedures, routine field inspection procedures
Complaints	Measuring instruments, pre-packed articles, trading practices, servicing licensees, public weighbridge licensees, fair trading matters relating to trade measurement

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RANGE STATEMENT	
Sources of information	Business/company details, organisational database, searches from other government agencies
Legislation	Enabling legislation, workplace, health and safety, environmental legislation, enforcement policies
Equipment	Reference standards, test equipment, safety equipment
Documentation	Organisational forms, notices, field books, product handling sheets, educational material/brochures

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15019B Conduct a field inspection

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers conducting a trade measurement field inspection on trader's premises.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement inspection activities in trading environments. It may be applied to trade measurement inspections involving pre-packed articles, auditing servicing licensees, public weighbridges, investigating consumer complaints, examining trading practices, performing verification/certification and in-service inspection. Relevant legislation/policies include enabling legislation, uniform test procedures, organisational policies and procedures, workplace, health and safety and enforcement policies. **Band**: **B** **Unit Weight**: **12**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Prerequisite units		
Path 1	MEM09002B	Interpret technical drawing
	MEM11011B	Undertake manual handling
	MEM12003B	Perform precision mechanical measurement
	MEM12004B	Perform precision electrical/electronic measurement
	MEM12005B	Calibrate measuring equipment
	MEM12023A	Perform engineering measurements
	MEM13003B	Work safely with industrial chemicals and materials
	MEM15004B	Perform inspection
	MEM15005B	Select and control inspection processes and procedures
	MEM15015C	Examine trading practices
	MEM15016B	Inspect pre-packed articles
	MEM15017C	Use and maintain reference standards
	MEM15018B	Investigate consumer complaints
	MEM16002C	Conduct formal interviews and negotiations
	MEM16004B	Perform internal/external customer service
	MEM18001C	Use hand tools
	MEM18002B	Use power tools/hand held operations

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop a work plan to conduct field inspections	1.1. Traders are identified for inspection in accordance with organisational priorities. 1.2. Routine field inspections are scheduled to complement other inspection activities whilst maximising organisational efficiencies and effectiveness. 1.3. Appropriate equipment is identified and accessed. 1.4. Specific inspection arrangements are made with the trader. 1.5. Relevant reference and/or technical information and trader history is researched.
2. Maintain test equipment during a field inspection	2.1. Test equipment is transported in accordance with manufacturers' specifications and organisational procedures. 2.2. Test equipment is operated within manufacturers' specifications and organisational procedures. 2.3. Failures and repairs of test equipment are reported in accordance with organisational procedures.
3. Conduct initial on-site assessment of the trading premises	3.1. Surveillance of the trading premises is undertaken to evaluate the trading practices in use. 3.2. Officer establishes their identity with the trader or responsible person and explains the purpose of the

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ELEMENT	PERFORMANCE CRITERIA
	inspection. 3.3. Local workplace, health and safety issues relevant to the premises are identified and appropriate action is taken to comply. 3.4. Measuring instruments used for trade are identified and the inspection is planned with minimal disruption to the trader. 3.5. Locations for product return or disposal are identified for later use.
4. Inspect instruments and/or trading practices	4.1. Measuring instruments are selected for inspection in accordance with organisational guidelines. 4.2. Test equipment is used in accordance with organisational procedures taking into consideration workplace health and safety factors. 4.3. Relevant test procedures for verification and in-service inspection are conducted in accordance with organisational procedures. 4.4. Inspection of pre-packed articles is conducted in accordance with organisational procedures. 4.5. Trading practices are identified and action is taken to remedy any non-compliance.
5. Undertake an investigation where a breach is detected	5.1. Evidence relating to the breach is gathered. 5.2. Trader and witnesses are interviewed for supporting evidence. 5.3. Chain of evidence is maintained.
6. Complete documentation for inspection	6.1. Instrument and trader information is recorded accurately for the organisation's information system. 6.2. Inspection documentation is completed in accordance with organisational procedures.
7. Advise trader of inspection outcomes	7.1. The trader is advised of instrument test, pre-packed article and trading practice results where appropriate. 7.2. The trader's enquiries and concerns are discussed. 7.3. Legislative requirements, obligations and possible corrective solutions are explained to the trader where appropriate. 7.4. The trader is advised of reporting procedures and possible outcomes for any detected breaches. 7.5. Follow-up activities are planned if required.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- accessing and interrogating organisation's information system for relevant trader information
- researching and collecting information
- scheduling inspection activities
- identifying priorities and their integration into routine field inspections
- being aware of the operational needs of the trader
- selecting instruments for tests
- completing calibration/repairs
- evaluating information gathered during surveillance to identify non-compliance
- conducting surveillance of trading premises
- using the organisation's identification procedure (e.g. ID card)
- explaining the purpose of the inspection to the trader
- obtaining workplace, health and safety information specific to the trading environment
- recording data plate information and instrument errors
- monitoring sales transactions
- assessing advertising used on or outside the premises
- identifying incorrect trading practices
- gathering evidence to prove a breach
- preparing interview questions to cover all elements of an offence
- using assertive communication and active listening

Required knowledge

Look for evidence that confirms knowledge of:

- the organisation's inspection priorities
- options for dealing with conflicting priorities
- a range of equipment used for trade measurement field inspections
- alternative contact arrangements
- a range of environmental factors that impinge on measuring instruments
- criteria for selecting instruments
- test equipment transportation specifications and procedures
- variations from transport specifications and procedures requiring appropriate approval
- variations from operating specifications and procedures requiring appropriate

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REQUIRED SKILLS AND KNOWLEDGE

approval

- types of failure that might occur and possible remedies in a range of test equipment
- preventative work practices/maintenance to keep equipment in good working order
- methods of surveillance
- legislative requirements for the inspection
- personal responsibility for workplace, health and safety
- workplace, health and safety issues relating to a range of occupational and business environments
- contingencies to facilitate minimal disruption to the trader
- action that would be taken if incorrect disposal occurs
- research methods used to determine instrument performance trends
- workplace, health and safety requirements for a range of test procedures and working environments
- a range of environmental and operational factors that may adversely influence the accuracy of instruments, and action required to remedy their effect
- organisational guidelines for the selection of pre-packed articles for inspection
- a range of non-compliance issues for trading practices
- strategies used to prove breaches of trading practices including trial purchases
- the format and procedure for conducting an interview in accordance with organisational guidelines
- the principles of natural justice; requirements of appropriate legislation; judges' or court rules; the organisation's code of conduct
- strategies for handling conflict
- cultural and gender issues that influence the communication/interviewing process
- maintenance of evidence integrity
- recording and secure storage of evidence in accordance with organisational procedures can be explained.
- types of ownership entities for legal responsibilities
- appropriate forms used for inspection outcomes including non-compliance and rejection notices, instrument performance records, fees and traders' files
- suitable environment to communicate inspection outcomes with trader
- strategies for handling conflict situation
- sensitivity to cultural and gender issues that influence the communication process
- corrective solutions for a range of scenarios
- legislative requirements for a range of trading environments
- reporting processes and outcomes
- accurate interpretation of enforcement guidelines
- methods for conducting a follow-up activity

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to conduct a field inspection. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with conducting a field inspection, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Technical information and trader history	Organisation's databases, business/company details
Trading practices	Advertising, over the counter sales, correct use of measuring instruments, method of sale of goods, positioning of instruments, environmental factors, suitability of instrument, over-pricing, incorrect measurement
Test equipment	Specific test equipment, reference standards, safety equipment, product handling equipment
Workplace, **health&safety**	Storage of test equipment, site/premises conditions, disposal of dangerous materials, storage of seized equipment, specific safety equipment and clothing
Non-compliance	Short measure, over-pricing, incorrect marking of packages
Documentation	Organisational forms, notices, field books, evaluation form or report, fees, servicing licensee forms, educational material/brochures

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Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15020C Perform verification/certification or in-service inspection

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers testing a range of measuring instruments used for trading activities.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement inspection/certification activities in public or private enterprises. This unit applies to the legal verification/certification or in-service inspection of measuring instruments used for trading activities. This unit may be applied to the inspection of trade measuring instruments, such as those used for measuring pre-packed articles, and direct and/or indirect trading to the public. Relevant reference material includes NSC certificates of approval, manufacturers' product specifications, Australian standards, WHS legislation, uniform test procedures, organisational procedures and guidelines, and certificates of verification. Where work requires measuring instruments of a lower level of complexity and range and lower scope relating to uniform test procedures, reference material etc., Unit MEM15004B (Perform inspection) or Unit MEM15005B (Select and control inspection processes and procedures) should be selected as appropriate. If use and maintenance of reference standards is required, Unit MEM15017C (Use and maintain reference standards) should also be selected.

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	Band: **B** **Unit Weight**: **12**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM09002B	Interpret technical drawing
	MEM11011B	Undertake manual handling
	MEM12023A	Perform engineering measurements
	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Describe the design and application of basic components in trade measuring instruments	1.1. The fundamental operating features for a range of measuring instruments are identified. 1.2. The purpose of major components within the range of measuring instruments is described.
2. Determine the type of inspection required for a range of measuring instruments	2.1. Instrument is assessed to determine whether a verification/certification or in-service tolerance is to be applied for inspection. 2.2. The processes required for both the verification/certification and in-service of a range of measuring instruments are explained. 2.3. Appropriate tolerances are identified for the determined inspection.
3. Perform inspection of measuring instruments to determine compliance	3.1. The operating environment of the instrument is analysed and monitored to determine its impact on the instrument. 3.2. Sources of any possible operational error in the use of measuring instruments/systems are identified. 3.3. Specialised equipment is selected and used in the prescribed manner for the inspection. 3.4. Inspection of measuring instrument is conducted in accordance with appropriate test procedures, legislation and policies, and workplace, health and safety considerations.
4. Finalise inspection and take appropriate action	4.1. The appropriate action to be undertaken is determined and implemented. 4.2. Performance trends of particular models of measuring instruments are identified and reported. 4.3. The information is recorded in the organisation's information system.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE
Look for evidence that confirms skills in: • examining instruments for existing verification/certification marks • identifying operational errors relevant to the type of instrument being tested • selecting and correctly using the test equipment • testing measuring instruments • preparing technical reports relating to verification/certification or in-service inspection • completing files
Required knowledge
Look for evidence that confirms knowledge of: • the major components and functions of an instrument • the purpose of major components and functions of an instrument • differences in the application of tolerances being applied • process variations between verification/certification and in-service inspection • appropriate tolerances for a range of measuring instruments • environmental factors that may not result in an instrument rejection but other remedial actions • specialised equipment that may be required from other organisations • the action to be taken where a conflict occurs between uniform test procedures and those test procedures contained in certificates of approval • removal of verification/certification marks is impractical on some instruments and the appropriate action to be taken in these circumstances • methods to monitor performance trends

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform verification/certification or in-service inspection. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and	Assessors must be satisfied that the candidate can

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EVIDENCE GUIDE	
evidence required to demonstrate competency in this unit	competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing verification/certification, or in-service inspection or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

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RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Range of measuring instruments	Length of measures and measuring instruments, area measuring instruments, measures of volume, liquor measuring instruments, liquid measuring instruments, weighing instruments, milk tanks, vehicle tanks, liquefied gas flow meters, electronic metering systems, natural gas flow meters, dimensional measuring instruments, supplementary measuring instrument, auxiliary devices
Monitoring	Specific test equipment, random inspections, surveillance, complaint inspection, comparison/analysis of data over time, collation of statistical information, auditing of servicing licensees
Specialised equipment	Reference standards, safety equipment, product handling equipment, test equipment, specialised test equipment vehicles
Legislation and policies	Enabling legislation, organisational policies and procedures, workplace, health and safety, environmental legislation, enforcement policies, conditions of licence
Workplace, **health and safety considerations**	Storage and transportation of test equipment, site/premises conditions, specific safety equipment and clothing, manual handling techniques
Recording documentation	Non-compliance notices, reflect/incorrect notices, fees, organisational reporting forms

Unit Sector(s)

Unit sector	

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM15021C Conduct audits of servicing licensees and public weighbridge licensees

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	The unit covers auditing the work undertaken by servicing licensees/certifiers and the operations undertaken by public weighbridge licensees.

Application of the Unit

Application of the unit	This unit is designed for those performing trade measurement audits on public and/or private trade measurement licensees. This unit applies to personnel working for or appointed by a trade measuring administering authority. In encompasses audits of measuring instruments and documentation supplied by licensee, such as instrument accuracy, instrument markings, and adherence to legislative requirements and test procedures. Reference material includes uniform test procedures, inspector handbook, NSC certificates of approval, and organisational procedures and guidelines. Workplace, health and safety considerations include storage of test equipment, site/premises conditions, manual handling techniques, and specific safety equipment and clothing. If use and maintenance of reference standards is required, Unit MEM15017C (Use and maintain reference standards) should also be selected. If verification/certification is required, Unit MEM15020C (Perform verification/certification or in-service inspection) should also be selected.

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	Band: **B** **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM09002B	Interpret technical drawing
	MEM11011B	Undertake manual handling
	MEM16004B	Perform internal/external customer service
	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Explain the licensing system for servicing licensees and public weighbridges	1.1. Major components of the licensing system for certification of measuring instruments are described. 1.2. Major components of the licensing system for public weighbridges are described. 1.3. The requirements for issuing servicing and public weighbridge licences in accordance with legislation and organisational policies/ procedures are described.
2. Identify measuring instruments for audit of certifiers	2.1. Servicing licensee's documentation is monitored for compliance with organisational requirements. 2.2. Organisational procedures are used to generate a list of measuring instruments to be audited.
3. Conduct performance audits on certifiers	3.1. Inspection of measuring instruments is performed to determine compliance in accordance with legislation and organisational procedures. 3.2. The certifier's procedures and documentation are assessed to ensure legislative requirements are met. 3.3. Results of audit are recorded in the organisation's information system. 3.4. Action required to remedy non-compliance is determined and applied.
4. Examine public weighbridge licensee's operations for compliance with legislation	4.1. Licensee's documentation is assessed for compliance with legislation and organisational requirements. 4.2. The operator's ability to undertake public weighbridge duties is observed for compliance with legislation. 4.3. Action required to remedy non-compliance is determined and applied.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in:

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REQUIRED SKILLS AND KNOWLEDGE

- evaluating servicing licensee's documentation for completeness of information
- monitoring lodgement of servicing licensee's documentation
- selecting instruments for auditing
- scheduling audits
- testing measuring instruments
- recording instrument errors
- assessing the certifier's documentation for accuracy against the instrument certified and legislative requirements
- completing audit reports
- determining and implementing appropriate remedial action
- assessing licensee's documentation for accuracy against the public weighbridge instrument certified and legislative requirements
- assessing signage, certificates and public weighbridge tickets for accuracy
- evaluating the operator's ability to perform the duties of a public weigher
- investigating and reporting detected breaches

Required knowledge

Look for evidence that confirms knowledge of:

- major components of the licensing system for certification of measuring instruments such as legislative requirements, eligibility, conditions of licence including provision of competent employees, provision of reference standards, use of test procedures, and use of reporting documentation and quality assurance systems
- major components of the licensing system for public weighbridge such as legislative requirements, eligibility, conditions of licence including provision of competent employees, maintaining accuracy of the public weighbridge, weighing methods and obligations, and use of reporting documentation
- the process for issuing servicing and public weighbridge licences, specifically the activities undertaken by trade measurement personnel
- the process for handling incomplete forms
- inspection variations between verification inspection and an audit inspection
- reporting variations for a range of instruments
- requirements to complete a public weighbridge ticket
- methods to complete a public weighbridge ticket
- requirements for authority to operate a public weighbridge
- duties of operator of public weighbridge
- options to remedy non-compliance

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to conduct audits of servicing licensees and public weighbridge licensees. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with conducting audits of servicing licensees and public weighbridge licensees, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation and organisational policies/procedures	Enabling legislation, workplace, health and safety practices, organisational policies and procedures, licensing conditions, enforcement policies
Documentation	Application forms, certification forms, non-compliance forms, public weighbridge tickets, documents as specified by legislation, educational material/brochures, batch test histograms

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Quality

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MEM15022B Verify reference standards

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	The unit covers verifying reference standards used for legal purposes.

Application of the Unit

Application of the unit	This unit applies to those performing verification of reference standards in a verifying authority organisation. It would mainly occur under laboratory conditions. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **8**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM09002B	Interpret technical drawing
	MEM12003B	Perform precision mechanical measurement

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Prerequisite units		
	MEM12023A	Perform engineering measurements
	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify the categories and levels of verification for reference standards	1.1. The categories of reference standards that the organisation is authorised to verify are identified. 1.2. The classes of reference standards required to verify a range of standards are identified. 1.3. Tolerances for a range of reference standards are identified. 1.4. Tolerances for a range of reference standards are described.
2. Maintain suitable environmental conditions to facilitate verification of reference standards	2.1. Reference standard details are recorded in accordance with organisational guidelines. 2.2. Sources of possible operational procedures errors in the verification of reference standards are identified. 2.3. Required atmospheric conditions for the verification

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ELEMENT	PERFORMANCE CRITERIA
	of a range of reference standards are applied. 2.4. Environmental conditions are assessed to determine whether a verification can be conducted.
3. Examine the design and required markings for a range of reference standards	3.1. The identification marking required for reference standards is located and explained. 3.2. Design features of a range of reference standards are correctly identified and applied. 3.3. The function of major components for a range of reference standards is described and applied. 3.4. The fundamental features of a range of reference standards are identified and explained.
4. Perform verification of reference standards	4.1. A variety of reference standards are verified. 4.2. Uncertainty and tolerances for reference standards are applied. 4.3. Results of verification are documented and certificate of verification is issued in accordance with organisational procedures, legislation and policies.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • researching and identifying suitable reference standards for verification within standards hierarchy • accessing reference manuals to gain appropriate information concerning tolerances for reference standards • completing the organisation's information tracking documentation • identifying operational errors relevant to the verification • locating identification marks on reference standards • researching design features on a range of reference standards • completing verification work sheets • completing and issuing certificates of verification
Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE
Look for evidence that confirms knowledge of: • relevant categories of reference standards for which the organisation is authorised to verify • a range of classes for reference standards • appropriate tolerance for a range of reference standards • current status of clients' reference standards • atmospheric factors required for verifying a range of reference standards • remedial action for atmospheric deficiencies • environmental factors that may adversely influence the integrity of the reference standards • remedial action for a range of environmental deficiencies • requirements for identification marking on reference standards • the purpose of design specifications • the purpose of the major components and functions of reference standards • the fundamental features of reference standards • the process for maintaining integrity of results including calculation • the reference material for uncertainty and maximum permissible errors for a variety of reference standards. • the process for producing certificates of verification in accordance with verifying authority status

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to verify reference standards. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

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EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with verifying reference standards, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

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RANGE STATEMENT	
regional contexts) may also be included.	
Reference standards	Mass, volume, density, area, length, master meters, temperature
Operating procedures	Manufacturers' specifications, industry guidelines, Australian standards, legislation, organisational procedures and guidelines
Legislation and policies	Enabling legislation, organisational procedures and guidelines Workplace health and safety legislation including storage and transportation of test equipment, handling of test equipment, handling of hazardous materials, safety clothing, manual handling techniques, site/premises conditions
Documentation	Fees, verification work sheets, certificate of verification

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Quality

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MEM16001 Give formal presentations and take part in meetings

Modification History

Release 1. Supersedes and is equivalent to MEM16001B Give formal presentations and take part in meetings

Application

This unit of competency defines the skills and knowledge required to participate in formal meetings and give formal presentations of information of a technical, job-related or trade-related nature. It covers communication skills needed for meetings governed by formal rules or well-established conventions.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Participate in formal meetings**	1.1	Receive, read and follow set meeting agenda
		1.2	Follow meeting conventions
		1.3	Contribute to discussions, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	1.4 Focus discussion on the objectives of the meeting
	1.5 Confirm action requirements arising from the meeting
2 **Give formal presentations**	2.1 Clarify objectives and scope of information required for presentation
	2.2 Prepare information and communication resources to support presentation, acknowledging sources used
	2.3 Ensure presentation is accurate, structured and includes all necessary content, and adheres to time limitations
	2.4 Use communication strategies to deliver effective presentation

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Meeting conventions include one (1) or more of the following:	• order of proceedings • punctuality • language expectations • relevancy • procedures for addressing others • facilitation by formal chairperson • recording of minutes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication resources include one (1) or more of the following:	• visual aids • audio visual aids • handout materials • charts and diagrams • props/objects • digital resources • demonstration • reports/print outs
Sources include one (1) or more of the following:	• colleagues • data • technical information sources • internet or web sources • supervisors • experience
Communication strategies include one (1) or more of the following:	• engaging eye contact with audience • speaking clearly and loudly enough for audience to hear • checking understanding of audience • asking questions • answering questions • listening effectively • using appropriate body language • maintaining focus on topic

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16001B Give formal presentations and take part in meetings

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16001 Give formal presentations and take part in meetings

Modification History

Release 1. Supersedes and is equivalent to MEM16001B Give formal presentations and take part in meetings

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- following an agenda and adhering to meeting rules/conventions
- contributing to discussions that focus on the objectives of the meeting
- giving a prepared presentation clearly and concisely using communication resources, as appropriate
- using effective communication strategies for meetings and presentations
- acknowledging all relevant resources.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- topics for discussion during the meeting
- meeting conventions and terminology
- objectives of the meeting
- topic/subject on which a presentation is to be made
- effective presentation techniques and communication strategies
- information to be conveyed
- sources of information to support presentation.

Assessment Conditions

- Assessors must:
  - have vocational competency in giving formal presentations and taking part in meetings at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16002 Conduct formal interviews and negotiations

Modification History

Release 1. Supersedes and is equivalent to MEM16002C Conduct formal interviews and negotiations

Application

This unit of competency defines the skills and knowledge required to plan, conduct and participate in interviews, and take part in negotiations. It requires the application of effective communication skills to explore defined ideas and achieve specific outcomes in formal on-site or small group situations.

This unit does not cover the skills needed for participation in formal group processes such as meetings which are covered by Unit MEM16001 Give formal presentations and take part in meetings.

For interviews associated with training and assessment, refer to the appropriate units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Plan and conduct**	1.1	Follow standard operating procedures and comply with

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	interviews		work, health and safety (WHS) requirements at all times
		1.2	Confirm purpose and required outcome/s of interview
		1.3	Plan and initiate interview to achieve a specified purpose
		1.4	Use suitable questions appropriate to the purpose
		1.5	Exercise discretion and confidentiality, as appropriate
2	**Participate in interviews**	2.1	Undertake suitable preparation
		2.2	Employ active listening skills
		2.3	Apply self-presentation appropriate to the purpose
		2.4	Ask open and closed questions, as appropriate, to gain required response/information
		2.5	Clarify follow-up activities and report in accordance with procedures
3	**Take part in negotiations**	3.1	Use language appropriate to the other party
		3.2	Select the appropriate communication medium
		3.3	State and clarify own and others' needs/wants
		3.4	Represent the views of fellow employees, including own group or team, to others
		3.5	Clarify follow-up activities and report in accordance with procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Interviews include one (1) or more of the following:	• job recruitment • job progression • performance reviews • grievance
Preparation includes one (1) or more of the following:	• identifying interview goals • identifying selection/assessment criteria • identifying and inviting co-interviewers • planning interview • determining open and closed interview questions • preparing interview room • accessing required documents and materials • introductions and explanations
Active listening skills include the following:	• appropriate body language and eye contact • acknowledgements • clarification of questions • appropriate responses • checking meaning
Communication medium includes one (1) or more of the following:	• face-to-face meeting • telephone • email • written • advocacy

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16002C Conduct formal interviews and negotiations

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16002 Conduct formal interviews and negotiations

Modification History

Release 1. Supersedes and is equivalent to MEM16002C Conduct formal interviews and negotiations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- confirming the purpose and required outcomes of the interview
- planning and formatting interviews and asking open and closed interview questions to gain required information
- building rapport, using active listening skills and exercising appropriate discretion and confidentiality
- taking part in negotiations using language and communication medium appropriate to other party and nature of negotiations
- clarifying and reporting of negotiation outcomes.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- purpose and assessment criteria of the interview
- procedures to be followed in planning and conducting the interview
- detail/information to be obtained from the interview and appropriate questions
- active listening techniques that can be applied in interview situations
- effects of the individual's presentation during the interview upon the interview
- effects of the timing of questions on the interviewee
- importance of following-up issues raised during the interview and negotiations
- procedures for reporting the outcomes of follow-up activities
- parties to be involved in the negotiations
- reasons for using appropriate language
- reasons for maintaining confidentiality
- reasons for clarifying the needs/wants of others and the individual
- views of fellow team or group members

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- range of communication media and appropriate communication medium.

Assessment Conditions

- Assessors must:
  - have vocational competency in conducting formal interviews and negotiations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16003 Provide advanced customer service

Modification History

Release 1. Supersedes and is equivalent to MEM16003B Provide advanced customer service

Application

This unit of competency defines the skills and knowledge required to provide comprehensive assistance to customers. It includes identifying a customer's relationship to the enterprise and determining how service could be improved.

Applications of this unit would typically be found in warehouses, service and design departments, and relate to internal or external customers, across a range of products and services. This may include the taking of one-off or special orders requiring detailed descriptions, the handling of complaints referred for more detailed assistance than the initial point of contact, and work as a designated liaison officer.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify customer relationship to enterprise**	1.1	Follow standard operating procedures and comply with work, health and safety (WHS) requirements at all times
		1.2	Identify customer as a new or repeat customer

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Obtain and check formal customer identification details for repeat customers and access information according to workplace procedures
		1.4	Capture information on new customers according to workplace procedures
2	**Identify customer requirements**	2.1	Identify customer requirements from order or other verbal or written communication
		2.2	Apply product knowledge to answer and address customer questions and support informed purchase decision
		2.3	Communicate clearly the degree to which customer requirements can be met
		2.4	Propose alternatives for any inability to completely satisfy customer requirements
		2.5	Use communication skills to provide positive customer experience
3	**Action customer requirements**	3.1	Undertake appropriate action to implement customer requirements
		3.2	Record customer requirements not able to be met immediately, and undertake follow-up checks according to procedures
		3.3	Communicate with customers to inform of service progress or completion, according to workplace procedures
4	**Address customer complaints**	4.1	Apply active listening skills and receive complaint information to ensure a thorough understanding of customer complaint
		4.2	Determine source of complaint or issue and report to relevant personnel

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Determine process for resolving complaint and confirm with customer
	4.4 Action process and maintain communication with customer until completion
	4.5 Assess effectiveness of resolution and report or record outcomes according to work procedures
5 **Promote better customer service**	5.1 Record products and services provided to customer, and any other customer information that can help to improve future relations
	5.2 Assess customer service provided and identify and report opportunities for improvement

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer liaison includes using one (1) or more of the following:	• telephone • written forms • email • face-to-face contact • digital/electronic tools
Customer	• price

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

requirements include one (1) or more of the following:	• delivery date • quantity • quality • specifications
Communication skills include one (1) or more of the following:	• active listening • asking and answering questions • appropriate body language • plain English • politeness • assertiveness • building rapport • calmness • patience • empathy • effective verbal communication • clarifying/checking meaning • addressing/minimising communication barriers
Appropriate actions to implement customer requirements include one (1) or more of the following:	• filling or entering order • corrective action to resolve complaints • repair or service to customer equipment
Sources of complaint or issue include one (1) or more of the following:	• damaged goods • poor service • delayed delivery • goods not received • incorrect specifications • difficult customer
Processes for resolving complaint include one (1) or more of the following:	• replacement • repair • price reduction • providing additional or improved service • explanation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- apology
- referral to appropriate personnel or other supplier
- suggest alternative product / service

Customer relationships include one (1) or more of the following:

- internal
- external
- repeat
- one-off
- new
- established
- significance in terms of purchase size, length of association, company status and relationship
- previous history
- special service requirements or conditions
- reciprocal arrangements
- supply chain relationship

Opportunities for improving customer service include one (1) or more of the following:

- new documentation
- new communication
- system improvements
- delivery improvements
- product or service improvements

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16003B Provide advanced customer service

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16003 Provide advanced customer service

Modification History

Release 1. Supersedes and is equivalent to MEM16003B Provide advanced customer service

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying customer relationship to the enterprise and ensuring customer information is complete, accurate and current
- applying product knowledge to address customer enquiries
- establishing rapport with the customer and providing positive customer experience
- handling difficult or unsatisfied customers and determining and implementing process of resolution
- determining and managing customer requirements not able to be met
- taking appropriate action to meet customer requirements according to procedures and recording customer products/service details
- reporting/recommending opportunities for improving customer service.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- procedures for:
  - identifying customers and defining customer relationships
  - identifying customer requirements
  - informing the customer of the degree to which the customer's requirements can be met
  - actioning customer orders
  - recording and managing customer complaints
  - initiating repairs and/or service to customer equipment
  - managing organisational errors in service provision
  - following up on unmet customer requirements
  - reporting/recommending improvement to customer service
- service provision procedures for new/repeat customers

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- customer relationship management system use and application
- features and characteristics of products and services offered
- product and service availability and processes
- range of customer requirements for product/service and alternatives available
- reasons for informing the customer promptly of the ability/inability to meet requirements
- principles and practices of effective customer service
- strategies for managing difficult customers
- record keeping requirements of customer service interactions and transactions.

Assessment Conditions

- Assessors must:
  - have vocational competency in providing advanced customer service at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16004 Perform internal/external customer service

Modification History

Release 1. Supersedes and is equivalent to MEM16004B Perform internal/external customer service

Application

This unit of competency defines the skills and knowledge required to provide assistance to internal and external customers across a range of products and services.

Typical applications of this unit would be found in service and design departments and include taking one-off or special orders requiring detailed descriptions or handling of complaints.

This unit should not be selected when Unit MEM16003 Provide advanced customer service has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify customer requirements**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	1.2	Identify customer requirements from verbal or written communication
	1.3	Determine product/service availability to meet customer requirements
	1.4	Communicate clearly the degree to which customer requirements can be met and propose alternatives for any inability to completely satisfy customer requirements
	1.5	Use communication skills to provide positive customer experience
	1.6	Complete documentation to record customer details and order requirements
2 **Action customer requirements**	2.1	Take appropriate action to implement customer requirements
	2.2	Record products and services provided to customer and complete require workplace documentation
3 **Handle customer issues**	3.1	Receive complaint information to ensure a thorough understanding of customer issue
	3.2	Determine required action and address or refer matter to appropriate personnel
	3.3	Record and follow up customer requirements not able to be met

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer liaison includes using one (1) or more of the following:	• telephone • written forms • email • face-to-face contact • digital/electronic tools
Customer requirements include one (1) or more of the following:	• product • service • price • delivery date • quantity • quality • specifications
Communication skills include one (1) or more of the following:	• active listening • asking and answering questions • appropriate body language • reading • writing • plain English • politeness • assertiveness • building rapport • calmness • patience • empathy • effective verbal communication
Appropriate action to implement customer requirements include one (1) or more of the following:	• filling or entering order • corrective action to resolve complaints • repair or service to customer equipment
Customer issues include	• damaged goods

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• poor service • delayed delivery • goods not received • incorrect specifications • difficult customer

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16004B Perform internal/external customer service

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16004 Perform internal/external customer service

Modification History

Release 1. Supersedes and is equivalent to MEM16004B Perform internal/external customer service

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- applying product knowledge to address customer enquiries
- establishing rapport with the customer and providing positive customer experience
- identifying customer requirements and clearly communicating the degree to which the customer requirements can be met
- proposing alternative products and/or services to satisfy customer requirements and taking action to implement these
- recording and following up customer requirements not able to be met.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- cost of the required product or service
- features and characteristics of products and services offered
- product and service availability and processes
- range of customer requirements for product/service and alternatives available
- reasons for informing the customer promptly of the ability/inability to meet the customer requirements
- strategies for managing customer issues
- record keeping requirements of customer service interactions and transactions
- procedures for:
  - actioning customer orders
  - recording and managing customer complaints
  - recording customer requirements which are not met
  - following up on customer requirements that are not met.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing internal/external customer service at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16005 Operate as a team member to conduct manufacturing, engineering or related activities

Modification History

Release 1. Supersedes and is equivalent to MEM16005A Operate as a team member to conduct manufacturing, engineering or related activities

Application

This unit of competency defines the skills and knowledge required to operate as a member of a team, where operations and outcomes are dependent on the performance of the entire team, and applies to a range of team activities that are carried out within a section of a manufacturing, engineering or a related work environment.

Activities are interdependent in nature, with each team member providing a critical component of the output and effective interaction and collaboration between team members is required in order to achieve team goals.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify team goals and processes**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times
		1.2	Identify team goals and requirements
		1.3	Identify processes in place to assist in meeting team goals
		1.4	Describe workflow and processes
		1.5	Identify roles and responsibilities of team members
		1.6	Identify relationships within team and with other work areas
2	**Communicate and cooperate with team members**	2.1	Use effective interpersonal skills to interact with team members and contribute to activities and objectives
		2.2	Use formal and informal forms of communication effectively to support team achievement
		2.3	Assist team members to ensure team achieves goals and requirements, as required
		2.4	Respect diversity and value in team functioning
		2.5	Recognise views and opinions of other team members and reflect in an accurate manner
		2.6	Use workplace terminology in a correct manner to assist communication
3	**Work as a team member**	3.1	Perform tasks in accordance with organisational and team requirements, specifications and workplace procedures
		3.2	Follow agreed reporting lines using procedures
4	**Solve problems as a team member**	4.1	Identify potential and real problems faced by team
		4.2	Identify procedures for avoiding and managing problems

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Solve problems effectively and in a manner which supports team functioning

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Team goals include one (1) or more of the following:	• production or manufacturing output • deadlines and timelines • resource use • performance • mistake elimination targets • process improvements • maintenance activity • safety levels
Effective interpersonal skills include one (1) or more of the following:	• basic listening and speaking skills • use of terminology and jargon • giving and receiving feedback • interpreting instructions • verbal and non-verbal modes and methods of communication • managing communication breakdowns and barriers • applying basic principles of effective communication
Formal and informal forms of communication	• meetings • documentation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:	• updates • handover • signage • discussion • explanations • demonstration • electronic
Diversity includes one (1) or more of the following:	• ethnicity • age • gender • ability / disability • opinions / beliefs • sexual orientation • language • status in the organisation • level of expertise
Workplace terminology is specific to the processes and equipment used in the workplace including one (1) or more of the following:	• equipment • processes • workplace areas • staff and procedures

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16005A Operate as a team member to conduct manufacturing, engineering or related activities

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16005 Operate as a team member to conduct manufacturing, engineering or related activities

Modification History

Release 1. Supersedes and is equivalent to MEM16005A Operate as a team member to conduct manufacturing, engineering or related activities

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- contributing to achievement of team goals
- communicating and cooperating with team members using effective interpersonal skills
- using formal and informal forms of communication effectively to support team achievement
- respecting diversity and value in team functioning
- using correct workplace terminology correctly to assist in communication
- identifying potential and real problems faced by the team and identifying procedures for avoiding, managing and solving problems in a manner which supports team functioning.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- effective interpersonal strategies and skills
- relationships and roles within team and with others
- benefits of diversity in the workplace
- reporting relationships and procedures
- own responsibilities with respect to products/services to be provided by team
- skills and competencies of the individual and other employees performing interdependent activities
- team goals, objectives and task requirements
- sources of technical expertise/assistance
- appropriate forms of communication.

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Assessment Conditions

- Assessors must:
  - have vocational competency in operating as a team member to conduct manufacturing, engineering or related activities at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16006 Organise and communicate information

Modification History

Release 1. Supersedes and is equivalent to MEM16006A Organise and communicate information

Application

This unit of competency covers the skills and knowledge required to access, organise and communicate information related to production, maintenance or associated processes or tasks that apply in manufacturing, engineering or related environments.

For accessing and recording of data requiring system knowledge and judgement, Unit MEM16008 Interact with computing technology should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015 Work safely and effectively in manufacturing and engineering

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Access information**	1.1	Determine information requirements of tasks and access relevant information from a range of sources
		1.2	Recognise and use workplace terminology correctly

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
2	**Organise and analyse information**	2.1 Interpret information and organise in accordance with work requirements 2.2 Determine relevance and implications for immediate work requirements
3	**Communicate organised information using established workplace methods**	3.1 Identify purpose of communication and appropriate communication method 3.2 Communicate information using established workplace methods

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Range of sources include using one (1) or more of the following:

- job instructions
- specifications
- standard operating procedures (SOPs)
- charts
- lists
- documents
- computer data
- drawings
- sketches
- tables

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- technical manuals and/or charts
- other applicable reference material

Determining relevance of information includes one (1) or more of the following:

- checking relevance of information to own work
- selecting task relevant information from a larger document or from a diagram
- preparing an opinion based on analysis of simple facts
- expressing an opinion on the cause of faults

Workplace terminology refers to one (1) or more of the following:

- equipment
- processes
- workplace areas
- staff
- procedures

Established workplace methods include using one (1) or more of the following:

- proforma reports
- data entry
- verbal
- drawings

Purpose of communication includes one (1) or more of the following:

- simple incident/non-conformance report
- maintenance request
- production records
- material usage records
- work records
- other standard workplace records

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16006A Organise and communicate information

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Assessment Requirements for MEM16006 Organise and communicate information

Modification History

Release 1. Supersedes and is equivalent to MEM16006A Organise and communicate information

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- accessing and recording relevant information from a range of sources
- recognising and using workplace appropriate terminology
- reading, interpreting and following information in workplace documentation
- checking and clarifying information
- organising, categorising and sequencing information
- communicating using appropriate methods and procedures for a variety of situations.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- types of information relevant to the workplace and required tasks
- terminology used in the workplace relevant to own work
- available sources of information
- information analysis techniques appropriate to tasks and position
- methods of categorising and organising information including correct sequencing of information
- methods of recording and communicating information.

Assessment Conditions

- Assessors must:
  - have vocational competency in organising and communicating information at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16008 Interact with computing technology

Modification History

Release 1. Supersedes and is equivalent to MEM16008A Interact with computing technology

Application

This unit of competency defines the skills and knowledge required to use a range of computing technology typically used in manufacturing, engineering or related environments to access, input and store information.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times
		1.2	Identify job requirements from specifications, job sheets or work instructions
		1.3	Identify information/data required to be accessed, input

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			or stored and its source
2	**Access information/data**	2.1	Follow access procedures and navigate technology to find the required information/data
		2.2	Use relevant software application menus, functions and commands to locate required information/data
		2.3	Retrieve information/data using organisational procedures
		2.4	Check information/data for relevance to job requirements
3	**Input information/data**	3.1	Use relevant software menus, functions and commands to manipulate information/data
		3.2	Enter, change or remove information/data, as required
4	**Store information/data**	4.1	Save data/files following standard procedures prior to exiting the application
		4.2	Produce data output, as required
		4.3	Follow procedures for shutting down/logging off/exiting computing technology
5	**Access assistance as required**	5.1	Identify appropriate personnel and consult, as required
		5.2	Identify manuals, online help and other reference materials and use, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Access procedures include one (1) or more of the following:	• logging on • security procedures • virus checks • start-up routines • application start-up
Technology includes one (1) or more of the following:	• hand held data recording devices • screen based equipment • personal computers • bar coders • tablets
Applications include one (1) or more of the following:	• word processing • spreadsheets • databases • customised engineering and manufacturing applications • material resource planning (MRP) • warehousing inventory applications • predictive reliability and maintenance applications • production data management applications
Data output includes one (1) or more of the following:	• report • email • chart • graph • printout • data transfer • labels

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16008A Interact with computing technology

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16008 Interact with computing technology

Modification History

Release 1. Supersedes and is equivalent to MEM16008A Interact with computing technology

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- accessing, inputting, manipulating and storing information using workplace computing technology whilst following standard procedures
- accessing assistance, where required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- functions and capabilities of computing technology used in the workplace
- functions of software applications
- use and features of data outputs.

Assessment Conditions

- Assessors must:
  - have vocational competency in interacting with computing technology at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16009 Research and analyse engineering information

Modification History

Release 1. Supersedes and is equivalent to MEM16009A Research and analyse engineering information

Application

This unit of competency defines the skills and knowledge required to research and analyse engineering information and prepare the information for dissemination.

Applications of this unit would typically be found in manufacturing and engineering work environments with materials and documents based on the relevant knowledge of the employee competency level.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16012	Interpret technical specifications and manuals

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Research information**	1.1 Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.2	Identify research requirements and clarify with appropriate persons
		1.3	Identify sources of research data/information and verify for currency and accuracy
		1.4	Compile information, record and store using research techniques appropriate to the task requirements
		1.5	Sort information for relevance to research and analysis requirements
		1.6	Conduct research within given timeframe, resource and quality constraints
2	**Analyse information**	2.1	Determine scope, criteria and method for analysis and verify, if necessary, with appropriate persons
		2.2	Analyse information accurately according to established criteria
		2.3	Document analysis in an appropriate format according to workplace requirements
3	**Establish findings and conclusions**	3.1	Ensure findings are factual and accurate and describe the results of the analysis
		3.2	Reach conclusions that are logical and based on objective analysis of available data
		3.3	Verify research data, analysis, findings and conclusions with appropriate persons where required
4	**Summarise and organise technical data**	4.1	Record information in suitable form according to workplace requirements
		4.2	Summarise information and organise for ease of reference, using established communication principles
		4.3	Disseminate information to others according to workplace procedures

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Research requirements include one (1) or more of the following:	• purpose • expected outcomes • scope and nature • timeframe • required resources
Sources of research data/information include one (1) or more of the following:	• surveys • interview • observation • test results • data records • reference books and journals • technical manuals • job histories • internal/external databases
Research techniques include one (1) or more of the following:	• surveying/scanning • skimming • questioning • note-taking • summarising • relationship diagrams • tabling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication principles include one (1) or more of the following:	• avoidance of ambiguity, redundancy, verbosity and circumlocution • writing in plain English • use of headings • logical ordering • summarising • layout • customising material to audience • use of graphics and tables

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16009A Research and analyse engineering information

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16009 Research and analyse engineering information

Modification History

Release 1. Supersedes and is equivalent to MEM16009A Research and analyse engineering information

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and confirming research requirements
- identifying sources of research data/information and verifying for currency and accuracy
- compiling, recording and storing research information using techniques appropriate to task requirements
- analysing information and data, sorting and documenting established findings and conclusions based on analysis and verifying conclusions with appropriate personnel
- summarising and organising information and technical data
- presenting information according to communication principles.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- basic principles and methods of research and analysis
- effective communication principles with respect to research, analysis and organisation of technical data
- sources of research data/information
- relevant personnel for consultation
- relevant information/data
- effect of variations in the information/data on the conclusions reached.

Assessment Conditions

- Assessors must:
  - have vocational competency in researching and analysing engineering information at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16010 Write reports

Modification History

Release 1. Supersedes and is equivalent to MEM16010A Write reports

Application

This unit of competency defines the skills and knowledge required to write technical or non-technical reports that include a basic level of analysis and/or research.

The term report is used to denote any required written communication that goes beyond a simple recording of facts such as completion of a pro forma shift production schedule.

Conclusions and/or recommendations where required are based on prior research or analysis of data. The analysis and conclusions should be consistent with the level of skill and knowledge of an employee working at that level.

Where more than a simple level of data research and analysis is necessary to produce information for the report, Unit MEM16009 Research and analyse engineering information should also be selected.

For preparation of simple technical reports, unit MEM16014 Report technical information should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM14006	Plan work activities
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify report requirements**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times
		1.2	Identify requirements for a written report and confirm with appropriate persons
		1.3	Access information for the report according to workplace procedures
		1.4	Assess information for currency, accuracy and relevance for inclusion in the report
2	**Prepare and produce report**	2.1	Develop a structure and outline of the report according to identified report requirements
		2.2	Write the report using terminology appropriate to the reader and established principles of report writing
		2.3	Base findings and conclusions on factual analysis
		2.4	Give recommendations, alternatives/suggestions and supply supporting evidence, as required
		2.5	Apply protocols, conventions and legal requirements related to acknowledgements and intellectual property, where necessary
3	**Finalise and distribute report**	3.1	Check the report for accuracy and edit, as required
		3.2	Ensure the completed report is consistent with objectives and requirements
		3.3	Copy and distribute the report and store according to instructions and workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements include one (1) or more of the following:

- purpose
- expected outcomes
- scope and nature
- timeframe
- required resources

Reports include one (1) or more of the following:

- reports types:
  - accident/injury
  - equipment report
  - memo and letter reports
  - information report
  - analytical report
- report structure:
  - title page
  - table of contents
  - summary
  - introduction
  - body (findings and conclusions)
  - recommendations
  - references
  - appendices
  - glossary
- report content:
  - text
  - graphs
  - charts
  - tables
  - diagrams

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Principles of report writing include one (1) or more of the following:

- use of headings, subheadings, sectioning and numbering
- objectivity
- expression
- language and grammar
- sentence and paragraph structure
- logical ordering and sequencing
- summarising and editing
- layout and spacing
- content relevancy
- use of graphics, charts, tables and illustrations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16010A Write reports

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16010 Write reports

Modification History

Release 1. Supersedes and is equivalent to MEM16010A Write reports

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying report requirements and required resources and confirming with appropriate personnel
- preparing the type of report to be written according to report requirements
- writing the report using principles of report writing appropriate to the reader
- presenting findings and conclusions based on factual analysis, making recommendations and supplying supporting evidence, as required
- copying and distributing report and storing according to workplace procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- principles of report writing
- report types and purposes
- structure, style and parts of a report
- use of language and expression in reports
- common writing pitfalls
- report numbering systems
- techniques for reviewing and editing
- importance and benefits of preparing reports appropriate for the intended audience
- referencing and the importance of acknowledging sources.

Assessment Conditions

- Assessors must:
  - have vocational competency in writing reports at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16011 Communicate with individuals and small groups

Modification History

Release 1. Supersedes and is equivalent to MEM16011A Communicate with individuals and small groups

Application

This unit of competency defines the skills and knowledge required to communicate effectively in interpersonal, mediated and group settings during a range of common workplace activities.

This unit includes written communication by letter, short memorandum or report.

Where basic research and structured report writing is required, Unit MEM16009 Write reports should also be selected.

Where research and analysis is required, Unit MEM16009 Research and analyse engineering information should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Plan and prepare**	1.1 Follow standard operating procedures and comply with

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	communication		work health and safety (WHS) requirements at all times
		1.2	Identify communication types and networks within the enterprise
		1.3	Follow enterprise conventions, policies and procedures when planning and preparing communication activities
		1.4	Select communication channels and codes appropriate to objectives, circumstances and receivers
		1.5	Plan communication and structure to promote the accurate transfer of meaning
		1.6	Establish communication setting and climate appropriate to purpose and content of message
		1.7	Prepare or obtain required resources
2	**Communicate effectively in interpersonal, mediated and group settings**	2.1	Apply effective communication skills, strategies and principles to communication activity
		2.2	Use verbal and non-verbal language appropriate to the topic, sensitivities and technical understanding of the persons being addressed
		2.3	Respect and consider individual differences
		2.4	Adhere to purpose and objectives of communication
		2.5	Encourage participation in communication
		2.6	Follow conventions, rules, policies and procedures during communication activity
3	**Evaluate communication**	3.1	Obtain feedback regarding the effectiveness of the communication activity
		3.2	Assess outcomes against communication objectives and selected channels and codes
		3.3	Identify communication barriers and determine and implement strategies for overcoming barriers

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication types include one (1) or more of the following:	• upward:
	  • reporting
	  • suggestions
	  • grievances
	• downward:
	  • policy and procedures
	  • job instruction
	  • feedback
	  • information sharing
	• horizontal:
	  • task coordination
	  • conflict resolution
	  • discussion
	  • problem solving
	  • information sharing

Communication networks include one (1) or more of the following:	• hierarchies • patterns or clusters of personnel • enterprise conventions, protocols and procedures for communication

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication channels and codes include one (1) or more of the following:

- written
- verbal:
  - spoken
  - visual
  - sound media
- non-verbal:
  - visual
  - sound
  - touch
  - taste and smell and combinations of these
- codes that give mutual meaning to a message:
  - verbal (spoken or written language)
  - non-verbal (symbols, emblems, body language)

Effective communication skills, strategies and principles include one (1) or more of the following:

- questioning and clarifying
- speaking and conversation skills
- effective and active listening
- reading and comprehension skills
- giving and receiving feedback
- giving and interpreting verbal and non-verbal messages
- using the telephone and similar mediated channels
- establishing communication climate
- basic conflict resolution
- seeking and acknowledging contribution
- agreeing on communication protocols
- clarifying the purpose of the communication activity
- principles and protocols for informal and formal meetings
- principles and protocols for speaking to a group
- group discussion strategies, principles and protocols
- interpersonal strategies and principles

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Communication activities include one (1) or more of the following:	• letters, memos or emails • telephone calls • meetings • individual discussion • task coordination • information sharing • small group discussions • writing reports • counselling co-workers • resolving issues or routine conflicts • talks or speeches
Individual differences include one (1) or more of the following:	• ethnicity • age • gender • ability / disability • opinions / beliefs • sexual orientation • language • status in the organisation • level of expertise

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16011A Communicate with individuals and small groups

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16011 Communicate with individuals and small groups

Modification History

Release 1. Supersedes and is equivalent to MEM16011A Communicate with individuals and small groups

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying communication types within the enterprise
- selecting appropriate enterprise networks for communication
- selecting and using various communication channels and codes in communicating to specific audiences
- communicating effectively using appropriate communication activities
- respecting and considering diversity within the audience
- obtaining feedback and assessing outcomes against communication objectives
- identifying communication barriers and implementing strategies to overcome them.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- communication process, stages and roles
- communication types and networks
- verbal and non-verbal channels - advantages and disadvantages
- verbal and non-verbal codes - advantages and disadvantages
- principles, strategies and conventions for interpersonal, mediated and group communication
- benefits of diversity in the workplace
- communication skills for sender and receiver
- communication blockages, barriers and breakdowns and strategies for overcoming them
- individual differences between communicators and strategies for effective communication
- establishing communication climate.

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Assessment Conditions

- Assessors must:
  - have vocational competency in communicating with individuals and small groups at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16012 Interpret technical specifications and manuals

Modification History

Release 1. Supersedes and is equivalent to MEM16012A Interpret technical specifications and manuals

Application

This unit of competency defines the skills and knowledge required to identify, access, interpret and analyse technical information in an enterprise. It covers explaining and using the information, and identifying implications of information changes on engineering or manufacturing work activities.

Where routine accessing, organising and communicating of information related to processes or tasks is required, MEM16006 Organise and communicate information should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Identify and locate technical information**	1.1 Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times
		1.2 Identify information needs and confirm with appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	resources		persons
		1.3	Identify workplace information resources and determine their location in the information system
		1.4	Obtain appropriate technical information
2	**Access technical information**	2.1	Locate relevant technical information using search techniques appropriate to the resource and information requirements
		2.2	Interpret symbols, codes, legends and abbreviations
		2.3	Obtain clarification or further explanation of technical information, as required
		2.4	Verify the revision status of the technical information to ensure currency and authenticity
3	**Interpret and analyse technical information**	3.1	Check technical information/data is appropriate to work requirements
		3.2	Interpret technical information and analyse for use in given engineering or manufacturing applications
		3.3	Use technical information according to the specific engineering or manufacturing application
4	**Explain and use information**	4.1	Explain information and analyses and distribute to appropriate personnel
		4.2	Use information resources according to work requirements
		4.3	Undertake work in accordance with acquired technical information
5	**Identify**	5.1	Monitor technical information systems for changes

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
implications of changes to technical information	5.2 Identify personnel affected by changes to internal or external specifications or other technical information
	5.3 Establish means of distributing changed information
	5.4 Document changes to technical information according to enterprise procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Information resources include one (1) or more of the following:	• documented management system (manufacturing, quality, environmental and WHS) • manufacturers' manuals • specifications • Australian Standards • international standards • customer requirements • industry manuals • codes of practice • legislation • quality documentation • equipment manufacturer specifications • engineering data sheets

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Location includes one (1) or more of the following:	• reference libraries • workplace storage areas • internet • site
Information system includes one (1) or more of the following:	• internal • external

Search techniques include one (1) or more of the following:	• computer database
	• internet search
	• standard techniques to identify relevant information:
	  • skimming and scanning
	  • identifying key words/ideas
	  • using index
	  • table of contents
	  • numbering
	  • classification systems

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16012A Interpret technical specifications and manuals

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16012 Interpret technical specifications and manuals

Modification History

Release 1. Supersedes and is equivalent to MEM16012A Interpret technical specifications and manuals

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and locating information resources appropriate for the purpose
- accessing, interpreting and drawing conclusions from analysis of technical information and data required for use in given engineering or manufacturing applications
- undertaking numerical operations, calculations and formulae appropriate to interpreting technical information
- communicating information and analyses of technical information and distributing to appropriate personnel in ways appropriate for the audience
- monitoring technical information systems for changes, notifying personnel and documenting changes to technical information according to procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- available industry information resources
- uses and applications of information resources
- range of formats that information can be presented
- location and retrieval requirements of system information
- correct process used to identify relevant specifications
- quality improvement processes for information systems
- interpretation of technical data and information
- appropriate communication strategies
- dissemination of information regarding information systems
- range of instructional techniques
- implications of changes to technical information
- procedures for responding to information changes.

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Assessment Conditions

- Assessors must:
  - have vocational competency in interpreting technical specifications and manuals at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16013 Operate in a self-directed team

Modification History

Release 1. Supersedes and is equivalent to MEM16013A Operate in a self-directed team

Application

This unit of competency defines the skills and knowledge required to effectively participate in a formally established, highly developed and self-directed team in which the individuals have a common aim, and the jobs and skills of each member fit in with those of others.

The team may have a single leader or shared leadership and would be responsible for all aspects of its designated function within operating parameters and constraints, and members would have day-to-day responsibility for managing themselves and the technical aspects of their work.

Where an individual works with others, such as within a section or department, unit MEM13015 Work safely and effectively in manufacturing and engineering should be regarded as sufficient.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify team function and composition**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times
		1.2	Identify and understand team purpose and scope
		1.3	Identify team composition, including role of self and team members
		1.4	Identify and understand established parameters, rules and team norms
2	**Participate in team planning**	2.1	Make significant contribution to planning the team activities, based on the individual's technical skills, knowledge and competence
		2.2	Make contribution to the allocation and performance of team tasks
3	**Function effectively as a team member**	3.1	Respect and consider individual differences
		3.2	Ensure interaction with team members is in accordance with established rules, conventions and procedures
		3.3	Perform tasks and responsibilities effectively and in accordance with team objectives
		3.4	Contribute to resolution of real or perceived team issues
		3.5	Make significant contribution to team performance, based on own technical skills and application of established principles and practices for effective teamwork
4	**Monitor and review team performance**	4.1	Participate effectively in the planning and development of team review processes
		4.2	Collect relevant performance data and analyse on an individual and team basis using standard enterprise procedures and methodology
		4.3	Use results to evaluate own and team performance

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	against established performance indicators and to assist determination of improvement requirements
	4.4 Use principles/techniques for effective team development to identify own/team improvement strategies
5 **Implement team performance improvements**	5.1 Implement performance improvement processes and strategies on an individual and collective basis using standard enterprise procedures
	5.2 Evaluate individual and team performance improvements using standard enterprise procedures
	5.3 Make adjustments to improvement strategies in accordance with team requirements and standard enterprise procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Teams include one (1) or more of the following:

- engineering production teams responsible for a product or process
- maintenance teams
- special-purpose
- project teams

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Team tasks include one (1) or more of the following:	• planning and scheduling activities • implementing plans or work programs • making production-related decisions • acting on problems • focusing on continuous improvement • effective use of resources
Principles and practices for effective teamwork include one (1) or more of the following:	• goals • problem solving • resolving conflict • team leadership • team decision making • team rules and norms • team roles and behaviours • team maintenance
Individual differences include one (1) or more of the following:	• ethnicity • age • gender • ability / disability • opinions / beliefs • sexual orientation • language • status in the organisation • level of expertise

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16013A Operate in a self-directed team

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16013 Operate in a self-directed team

Modification History

Release 1. Supersedes and is equivalent to MEM16013A Operate in a self-directed team

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying team composition and managing day-to-day activities within operating parameters and constraints
- participating in team planning and making significant contribution to team activities and resolution of team issues
- respecting and considering diversity within the team
- communicating and interacting effectively with team members
- making individual and joint decisions
- reviewing performance against indicators, identifying strategies to improve team performance and implementing performance improvement processes according to procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- team objectives, targets/goals, performance indicators, processes, rules and conventions
- team member roles – task and behavioural
- team member technical skills, knowledge and competence relevant to the tasks being planned
- scope of work for which the team is responsible
- benefits of diversity in the team
- methods for planning team activities and person(s) responsible for team planning
- impact of planning decisions on other teams, personnel and/or resources
- procedures for obtaining resources
- characteristics of effective teams, including structure, formation and operation of teams
- strategies for effective team development/functioning and team communication
- forms of team leadership and decision making

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- strategies and techniques for resolving conflict and team problem solving
- issues that may affect team performance
- sources of data relevant team performance indicators and reasons for reviewing team performance
- methods/procedures to evaluate team performance
- where appropriate, source(s) of approval to change team performance parameters
- processes/strategies for improving team performance.

Assessment Conditions

- Assessors must:
  - have vocational competency in operating in a self-directed team at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM16014 Report technical information

Modification History

Release 1. Supersedes and is equivalent to MEM16014A Report technical information

Application

This unit of competency defines the skills and knowledge required to prepare reports of a technical nature on tasks or assignments within the employee's skill and competence. The technical information being reported is based on analysis and/or research appropriate for the information being conveyed and applies to the reporting of technical and engineering information beyond simple communication of facts (including completion of a proforma shift production schedule).

Where an individual works with others, such as within a section or department, unit MEM13015 Work safely and effectively in manufacturing and engineering should be regarded as sufficient.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Communication

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify information**	1.1	Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	required for report	1.2	Identify reporting requirements according to procedures and confirm with appropriate persons, as necessary
		1.3	Determine methods for investigating and justifying information to be presented
2	**Prepare report**	2.1	Access information required for the report according to workplace procedures
		2.2	Assess information for currency, accuracy and relevance for inclusion in report
		2.3	Ensure the content, structure and format of information is appropriate for the information and type of report
		2.4	Base findings and conclusions on factual analysis
		2.5	Give recommendations and alternatives and supply supporting evidence as required
		2.6	Copy the report, distribute and store according to instructions and workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Report structure includes	• reference to the scope of the report • justification for any conclusions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

the following:	• references to any authorities or persons responsible for investigations and or conclusions • description of the methodology involved in preparing and analysing the technical information in the report
Report types include one (1) or more of the following:	• accident/injury report • equipment purchase report • condition monitoring report • test results • production data • a standard workplace format • memoranda • written short reports
Reporting requirements include one (1) or more of the following:	• purpose • expected outcomes • scope and nature • timeframe • required resources

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM16014A Report technical information

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM16014 Report technical information

Modification History

Release 1. Supersedes and is equivalent to MEM16014A Report technical information

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying reporting requirements and confirming with appropriate personnel
- preparing report to convey technical information ensuring content contains all available information, conclusions and description of the methodology involved in preparing and analysing the technical information in the report
- using terminology and language appropriate to the target audience
- presenting findings and conclusions based on factual information and making recommendations and alternatives with supporting evidence
- copying, distributing and storing report according to procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- reporting methods and purposes
- structure, style and parts of a technical report
- correct use of language and expression
- techniques for checking and editing
- importance and benefits of preparing reports appropriate for the intended audience
- referencing and the importance of acknowledging sources.

Assessment Conditions

- Assessors must:
  - have vocational competency in reporting technical information at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM17001 Assist in development and deliver training in the workplace

Modification History

Release 1. Supersedes and is equivalent to MEM17001B Assist in development and deliver training in the workplace

Application

This unit of competency defines the skills and knowledge required to plan and deliver on-the-job training and review the training program and includes structured or informal training, based on cooperation between trainer and other training personnel and is delivered in a one-to-one or small group situation.

Where assessment skills are required unit MEM17002 Conduct workplace assessment should also be selected.

Where normal supervision of an apprentice is required unit MEM17003 Assist in the provision of on-the-job training should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Training

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Plan for delivery of on-the-job training**	2.1	Identify objectives of training and competency to be achieved
		2.2	Clarify role in provision of training
		2.3	Prepare content required to meet training objectives
3	**Deliver on-the-job training**	3.1	Explain training objectives to trainee
		3.2	Carry out training using appropriate techniques
		3.3	Monitor trainee progress and provide constructive feedback to trainee
4	**Review training program**	4.1	Evaluate training program following feedback from participants according to SOPs
		4.2	Record and report training data according to SOPs
		4.3	Promote training according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Objectives of training include one (1) or more of the following:

- achieve effective and safe operation of equipment
- induction to organisational practices and procedures
- continuous improvement
- provision of technical information

Appropriate techniques include the following:

- logical presentation
- sound communication methods
- explanation
- demonstration
- practice
- feedback

Communication techniques include one (1) or more of the following:

- active listening
- using pauses
- using clear, concise and courteous language
- using suitable workplace terminology
- questioning to confirm understanding and elicit information
- selecting timing of interactions
- selecting environments conducive to effective communication

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM17001B Assist in development and deliver training in the workplace

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM17001 Assist in development and deliver training in the workplace

Modification History

Release 1. Supersedes and is equivalent to MEM17001B Assist in development and deliver training in the workplace

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining, through consultation, the objectives of training and the role of on-the-job training with appropriate personnel
- planning training delivery
- using appropriate communication techniques
- determining and using suitable training techniques
- conducting appropriate training sessions in a safe and effective manner, including the appropriate use of personal protective equipment (PPE)
- monitoring trainee's progress and providing feedback
- reporting trainee's progress through appropriate channels.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- competencies to be achieved through training
- role of the trainer in the provision of training
- identification of person(s) to be trained
- skills and knowledge to be learned
- training location(s)
- tools, equipment, materials and resources required
- training techniques and reasons for selecting chosen training techniques to be used in delivering training
- the reasons for monitoring trainee progress
- procedures for recording trainee progress and reasons for providing feedback
- procedures and reasons for evaluating training programs
- training records to be kept and procedures for recording training data

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- procedures for preparing training reports
- procedures and reasons for promoting training in the workplace.

Assessment Conditions

- Assessors must:
  - have vocational competency in assisting in developing and the delivering of training in the workplace at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM17002 Conduct workplace assessment

Modification History

Release 1. Supersedes and is equivalent to MEM17002B Conduct workplace assessment

Application

This unit of competency defines the skills and knowledge required to conduct workplace assessment on an individual basis or in groups where appropriate assessment techniques will be selected based on assessor knowledge of the competency to be assessed or in conjunction with someone who is competent (technical expert).

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Training

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify and plan assessment requirements**	2.1	Identify area and purpose of assessment in consultation with appropriate personnel and candidate/s being assessed
		2.2	Identify and select appropriate standards and assessment guides, as required
		2.3	Determine evidence required to establish competency according to industry and enterprise assessment procedure
		2.4	Discuss and confirm evidence required and assessment arrangements to be confirmed in an appropriate way with candidates/s being assessed
3	**Carry out assessment**	3.1	Implement agreed assessment procedure in a manner, time and location to maximise active participation from assessment candidate/s
		3.2	Gather evidence consistent with the agreed assessment procedure using appropriate and specified methods and tools, and document according to agreed industry or site procedures
		3.3	Make evaluation and assessment decisions according to agreed assessment procedures
		3.4	Provide clear and appropriate feedback to candidate/s assessed
		3.5	Provide advice to assessment candidate/s on training needs, appeal mechanisms, as appropriate
4	**Record results**	4.1	Record assessment results according to industry or site

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
and review the procedure	procedures
	4.2 Keep/store records in a manner appropriate to maintenance of confidentiality and safety
	4.3 Review assessment procedures in cooperation with candidate/s being assessed and revise, as appropriate

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Purpose of assessment includes one (1) or more of the following:	• recognition of prior learning • determination of award classification level • identification of training needed
Additional evidence required includes the following:	• task skills, task management and contingency management application
Assessment procedures include one (1) or more of the following:	• observation • documentation • demonstration • projects • oral tests • computer based assessment • written tests

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate and specified methods and tools include the following:	• clarity, reliability, validity of results, fairness in assessment application, and cost effectiveness of process

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM17002B Conduct workplace assessment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM17002 Conduct workplace assessment

Modification History

Release 1. Supersedes and is equivalent to MEM17002B Conduct workplace assessment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting relevant units of competency and assessment guides and determining purpose of assessment with the candidate/s being assessed
- discussing and confirming evidence required and the assessment arrangements
- evaluating evidence and making assessment decisions
- providing positive feedback to the candidate/s and providing advice on training gaps and appeal mechanisms
- recording and storing assessments results and notifying appropriate personnel with results of assessment
- reviewing and revising assessment procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- area and purpose of the assessment
- persons to be consulted when determining the assessments to be carried out
- relevant competencies
- evidence required to establish competency and reasons for identifying the evidence to be obtained
- industry assessment procedure
- reasons for discussing and confirming the assessment arrangements with the assessment candidate
- time and location of the assessment and reasons for selection
- methods and reasons for using selection methods and evaluating the gathering of evidence
- procedures for documenting the assessment
- need to provide clear and positive feedback to the assessment candidate
- appeals procedures

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- any further training required by the assessment candidate
- procedures for recording assessment results and keeping and storing assessment records securely
- procedures for reviewing assessments undertaken
- reasons for evaluating assessment methods/procedures and procedures for revising them.

Assessment Conditions

- Assessors must:
  - have vocational competency in conducting workplace assessment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM17003 Assist in the provision of on-the-job training

Modification History

Release 1. Supersedes and is equivalent to MEM17003A Assist in the provision of on the job training

Application

This unit of competency defines the skills and knowledge required to assist in the provision of on-the-job training to others while undertaking normal duties and it may involve the replacement of normal duties with training duties for limited periods of time. The individual would not be expected to be solely responsible for the assessment or reporting of a trainee's progress.

Typical applications could include the provision of on-the-job training by a tradesperson to apprentices/trainees or by a production worker to other production workers/trainees.

Where the development of training programs is required unit MEM17001 Assist in development and deliver training in the workplace should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Training

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Identify objectives of training and role of on-the-job training in consultation with appropriate personnel
		1.6	Develop a plan for the training
2	**Provide on-the-job training**	2.1	Conduct training using methods appropriate to the training objectives and learner
		2.2	Monitor trainee progress and provide feedback appropriate to the learning outcomes
		2.3	Report trainee's progress according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Training methods include one (1) or more of the following:	• explanation • demonstration • simulation
Reports include the following:	• information about the skills satisfactorily achieved and those where further practice is required

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM17003A Assist in the provision of on the job training

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM17003 Assist in the provision of on-the-job training

Modification History

Release 1. Supersedes and is equivalent to MEM17003A Assist in the provision of on the job training

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining through consultation the objectives of training and the role of on-the-job training
- planning training delivery
- conducting appropriate training in a safe and effective manner, including the appropriate use of personal protective equipment (PPE)
- using appropriate training methods
- monitoring trainee's progress and providing feedback
- reporting trainee's progress through appropriate channels.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- requirements for planning occasional on-the-job training
- features of training with relevant personnel, including:
  - identification of person(s) to be trained
  - the individual's role in the provision of training
  - skills and knowledge to be learned
  - procedures to be followed
  - training location(s)
  - tools, equipment, materials and resources required
  - appropriate delivery method/s
  - the role of feedback in the provision of on-the-job training
  - the reasons for monitoring trainee's progress
- reporting procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in assisting in the provision of on the job training at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18001 Use hand tools

Modification History

Release 1. Supersedes and is equivalent to MEM18001C Use hand tools

Application

This unit of competency defines the skills and knowledge required to use a range of hand tools for a variety of general engineering applications.

This unit should not be selected if the hand tool is dedicated to a single operation or machine or when a machine-specific/customised tool is used.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Use hand tools for general engineering applications**	2.1	Select hand tools appropriate to the task requirements
		2.2	Use hand tools to produce outcomes that meet job specifications
		2.3	Identify unsafe or faulty tools and mark for repair according to designated procedures before, during and after use
		2.4	Undertake routine maintenance of tools using engineering principles, tools, equipment and procedures
		2.5	Store hand tools safely in appropriate location according to procedures and manufacturers' recommendations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hand tools include one (1) or more of the following:	• hacksaws • hammers • punches • screwdrivers • sockets • wrenches • scrapers • chisels • gouges • wood planes • files of all cross-sectional shapes and types • hand held taps and dies
Applications include one (1) or more of the following:	• adjusting • dismantling • assembling and finishing of items or components • finishing, cutting, scraping of metallic and non-metallic material to size and shape • tapping/retapping and threading/rethreading new/damaged threads
Drawings include one (1) or more of the following:	• drawings and sketches not covered by AS 1100 Technical drawing or AS 1102 Graphical symbols for electrotechnical documentation, and their equivalents • work specifications that include graphic representations that do not require interpretation
Job specifications include one (1) or more of the following:	• finish • tension • size • shape
Routine maintenance includes one (1) or more of the following:	• cleaning • lubricating • tightening • simple tool repairs • adjustments

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18001C Use hand tools

Links

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Assessment Requirements for MEM18001 Use hand tools

Modification History

Release 1. Supersedes and is equivalent to MEM18001C Use hand tools

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and using hand tools to produce the desired outcome to job specifications
- following designated procedures for dealing with unsafe or faulty tools
- undertaking routine maintenance and cleaning of hand tools, including storage.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- features and applications of different hand tools used in a general engineering context, including hacksaws, hammers, punches, screwdrivers, sockets, wrenches, scrapers, chisels, gouges, wood planes and files of all cross-sectional shapes and sizes
- common faults and/or defects in hand tools
- procedures for marking unsafe or faulty tools for repair
- routine maintenance requirements for a range of hand tools, including lubricating, tightening, simple tool repairs and adjustments using engineering principles and relevant equipment
- storage location and procedures for a range of hand tools.

Assessment Conditions

- Assessors must:
  - have vocational competency in using hand tools at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18002 Use power tools/hand held operations

Modification History

Release 1. Supersedes and is equivalent to MEM18002B Use power tools/hand held operations

Application

This unit of competency defines the skills and knowledge required to use a range of hand held power tools and fixed power tools for hand held operations used in a variety of general engineering applications.

This unit should not be selected if the power tools used are dedicated to an operation or machine, e.g. nut-runner, air drill and power driver.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use hand tools is required unit MEM18001 Use hand tools should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011 Undertake manual handling

MEM13015 Work safely and effectively in manufacturing and engineering

MEM16006 Organise and communicate information

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Use power tools for general engineering applications**	2.1	Select power tools appropriate to the task requirements
		2.2	Use power tools for a determined sequence of operations to produce desired outcomes to job specifications
		2.3	Identify unsafe or faulty tools and mark for repair before, during and after use according to SOPs
		2.4	Undertake operational maintenance of tools according to principles, techniques and SOPs
		2.5	Store power tools safely in appropriate location according to manufacturers' recommendations and SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Power tools include one (1) or more of the following:	• electric or pneumatic/hydraulic drills • grinders • jigsaws • nibblers • cutting saws • sanders • planers • routers • pedestal drills • pedestal grinders
Power tool operations include one (1) or more of the following:	• clamping • alignments • adjustments
Applications include one (1) or more of the following:	• loosening and fastening items or components • shaping, finishing, cutting, grinding of metallic and non-metallic materials and/or tool bits to size and shape
Drawings include one (1) or more of the following:	• drawings and sketches not covered by AS 1100 Technical drawing or AS 1102 Graphical symbols for electrotechnical documentation, and their equivalents • work specifications that include graphic representations that do not require interpretation
Clamping includes one (1) or more of the following:	• multigrips • vices • jigs and fixtures • clamps
Job specifications include one (1) or more of the following:	• finish • size • shape
Operational maintenance includes one (1) or more of the following:	• cleaning • lubricating • tightening

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18002B Use power tools/hand held operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18002 Use power tools/hand held operations

Modification History

Release 1. Supersedes and is equivalent to MEM18002B Use power tools/hand held operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and using a range of hand held and fixed power tools for a variety of general engineering applications
- following designated procedures for dealing with unsafe or faulty power tools
- undertaking routine maintenance and cleaning of power tools, including storage.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- features and application of different power tools
- clamping/securing methods
- adjustments/alignments to a range of power tools
- common faults and/or defects in power tools
- procedures for marking unsafe or faulty power tools for repair
- routine maintenance requirements and cleaning of a range of power tools
- storage location and procedures of a range of power tools.

Assessment Conditions

- Assessors must:
  - have vocational competency in using power tools/hand held operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18003 Use tools for precision work

Modification History

Release 1. Supersedes and is equivalent to MEM18003C Use tools for precision work

Application

This unit of competency defines the skills and knowledge required to use tools to manually produce work to precise dimensions and/or finishes.

It covers performing precision tasks on a range of metallic and non-metallic materials using a variety of tools, instruments and power equipment.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where precision measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where precision marking out is required unit MEM12006 Mark off/out (general engineering) should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011 Undertake manual handling

MEM12023 Perform engineering measurements

MEM13015 Work safely and effectively in manufacturing and engineering

MEM16006 Organise and communicate information

MEM18001 Use hand tools

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MEM18002 Use power tools/hand held operations

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare tools and tooling to produce precision outcome**	2.1	Select processes/techniques appropriate to the precision work to be undertaken, material and specifications
		2.2	Select tools, accessories and consumables appropriate to task, specifications and material
		2.3	Prepare tools/tooling and adjust, as required
3	**Use tools to produce work to precise specifications**	3.1	Prepare the work piece and secure using appropriate method for selected operation
		3.2	Use tools to produce specified outcome to the required accuracy in accordance with SOPs
		3.3	Inspect tools and equipment for safe and proper working order before, during and after use
		3.4	Identify unserviceable tools, repair where appropriate, or mark for repair or disposal, according to prescribed procedure

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Undertake inspection and maintenance of tools and equipment according to standard workplace procedures, principles and techniques
	3.6 Store and maintain tools to ensure serviceability

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Techniques include one (1) or more of the following:	• cutting out • drilling • fitting • filing • reaming • lapping • broaching • burnishing • scraping • polishing • hand held grinding • chiselling

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Precision work includes one (1) or more of the following:	• scraping machine beds to precise tolerances • broaching a keyway • hand reaming the bore of a spigot or bush to a positive transition fit with shaft • core drilling (finishing) a blind hole to receive a mating pin • lapping a mechanical seal to fine finish • filing complex angles and mating edges • precision grinding using a flexible drive shaft attachment
Precision outcomes include one (1) or more of the following:	• specified tolerances • allowances • fits • finishes • alignments
Tools or equipment required to achieve precision outcomes include one (1) or more of the following:	• reamers • files • chisels • polishing buffs • lapping plate • broaches • flat, half round and bore scrapers
Tool adjustment includes one (1) or more of the following:	• tool shape • rake angle • clearance angles
Inspection and preventative maintenance include one (1) or more of the following:	• visual checking of leads and connections • sharpening of cutting equipment • repair of associated tools

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18003C Use tools for precision work

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18003 Use tools for precision work

Modification History

Release 1. Supersedes and is equivalent to MEM18003C Use tools for precision work

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- preparing tools for precision outcomes, including selecting processes and engineering techniques, methods and procedures appropriate to the task
- determining and making tool adjustments to produce required outcome, where applicable
- selecting and using precision tools and equipment to produce the desired outcome to meet job specifications
- following designated procedures for dealing with unsafe or faulty tools
- undertaking routine repair/operational maintenance of tools and equipment and storing in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- work to be undertaken and specifications to be achieved
- appropriate tools, processes and equipment required to carry out the work to the required specifications and reasons and procedures for using the selected tools
- engineering principles to be applied during the use of the tools
- manufacturers' specifications of the tools and equipment selected
- procedures for checking tools and equipment for correct and safe operation
- common faults and/or defects in tools and equipment used/selected
- procedures for marking unsafe or faulty tools and equipment for repair
- repairs/operational maintenance that can be made to the tools and equipment used/selected
- procedures for repairing/maintaining the tools and equipment used/selected
- procedures for checking/storing tools and equipment used/selected prior to storage and storage location.

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Assessment Conditions

- Assessors must:
  - have vocational competency in using tools for precision work at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18004 Maintain and overhaul mechanical equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18004 Maintain and overhaul mechanical equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18004B Maintain and overhaul mechanical equipment.

Application

This unit of competency defines the skills and knowledge required to diagnose, locate faults, repair, overhaul, fit and adjust mechanical systems and equipment.

It integrates the application of prerequisite diagnostic, maintenance and overhaul competencies and applies to situations where an integrated level of skills in maintenance and overhaul of mechanical systems and equipment is required.

Where gland packing is required, unit MEM18013 Perform gland packing should also be selected.

Where additional specialist skills are required select appropriate units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18005	Perform fault diagnosis, installation and removal of bearings
MEM18006	Perform precision fitting of engineering components
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies
MEM18009	Perform precision levelling and alignment of machines and engineering components
MEM18011	Shut down and isolate machines/equipment
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Perform maintenance tasks and adjustments**	2.1	Perform maintenance tasks on mechanical equipment, components or sub-assemblies to meet specifications
		2.2	Check mechanical equipment, components and sub-assemblies visually and with test equipment to ensure correct function or determine malfunction
		2.3	Make adjustments to equipment or components to ensure specifications are met
3	**Diagnose and locate faults**	3.1	Determine equipment component function by reference to engineering drawings, technical manuals and/or consultation with appropriate personnel
		3.2	Check maintenance reports, review and diagnose faults
		3.3	Carry out consultation with operators and other relevant plant personnel to assist in locating faults, as required
		3.4	Diagnose fault condition and localise at component level using appropriate test equipment and procedures
		3.5	Evaluate faulty condition and take appropriate corrective action
		3.6	Document faults according to SOPs
4	**Repair or overhaul mechanical system**	4.1	Isolate machine or equipment safely or check for isolation
		4.2	Remove faulty equipment, component or sub-assembly from system
		4.3	Select replaceable items from manufacturers' catalogues and obtain by appropriate means
		4.4	Select correct repair procedure, tools and equipment and prepare for use on serviceable items
		4.5	Service, repair or overhaul items to manufacturers' or site specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.6	Check components for compliance to specifications, where applicable
5 Fit and adjust mechanical equipment	5.1	Adhere to all electrical, safety and site requirements throughout the maintenance cycle
	5.2	Complete maintenance report to procedures and convey to designated personnel
	5.3	Determine fitting requirements and carry out sequential assembly planning, where applicable
	5.4	Prepare and assemble component parts using fastening equipment and methods which ensure conformance to specifications, operational performance, quality and safety
	5.5	Select correct jointing and gasket materials and apply in conformance to specifications and operational requirements
	5.6	Determine correct lubrication requirements by appropriate means and attend to, where applicable, using mechanical or manual applications
	5.7	Level mechanical equipment as appropriate using appropriate wedges and levelling devices
	5.8	Perform correct alignment and balancing functions, where appropriate
	5.9	Perform final adjustments on mechanical equipment to align to operational specifications
	5.10	Test mechanical equipment for accuracy and correct operation where applicable, and return to service to specifications
	5.11	Obtain appropriate work and safety clearances throughout maintenance cycle

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance tasks include one (1) or more of the following:	• correct operation • lubrication • adjustments

Test equipment includes one (1) or more of the following:	• engineers' level
	• laser alignments
	• appropriate equipment for measurement of:
	  • alignment
	  • flatness
	  • squareness
	  • straightness
	  • temperature
	  • vibration
	  • load deflection
	  • noise level
	  • RPM

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fitting techniques utilised in the assembly/disassembly of component parts using fastening equipment and methods and procedures to specifications include one or more of the following:	• dowelling
	• pinning and pegging
	• keying
	• thread production and repair which ensures conformance to specifications, operational performance, quality and safety
	• the straightforward removal and replacement of pre-manufactured bearings and seals
	• using acceptable maintenance procedures
	• appropriate lubrication
	• jointing/gaskets
	• seals
	• selection and application of materials in conformance to application requirements and specifications, as applicable
	• manufacture of new or replacement components, including:
	  • marking out
	  • drilling
	  • scraping
	  • filing
	  • reaming
	  • tapping
	  • threading

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18004 Maintain and overhaul mechanical equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18004B Maintain and overhaul mechanical equipment.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18004 Maintain and overhaul mechanical equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18004 Maintain and overhaul mechanical equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18004B Maintain and overhaul mechanical equipment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to maintain and overhaul mechanical equipment
- performing maintenance tasks on mechanical equipment, components or sub-assemblies in accordance with procedures
- assessing mechanical equipment, components and sub-assemblies visually and with appropriate test equipment to ensure correct function or determine malfunction and make adjustments according to procedures
- diagnosing and locating faults using appropriate diagnostic techniques, including visual inspection and use of test equipment, and localising fault condition to component level
- repairing or overhauling faulty equipment using appropriate fitting techniques and principles, tools, equipment and procedures and to manufacturers' or site specifications
- fitting and adjusting mechanical systems and equipment by applying sound fitting principles and techniques to specifications
- performing final adjustments and testing mechanical equipment for accuracy and correct function to align with operational specifications and return to service in accordance with work site procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- preventative maintenance procedures
- functions of system/equipment and their operational requirements
- causes and symptoms of faults and failures
- system and equipment hazard identification and isolation procedures

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- options for sourcing replacement parts
- consequences of incorrect adjustments
- procedures for testing the mechanical systems and equipment
- procedures for returning mechanical systems and equipment to service.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and overhauling mechanical equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18005 Perform fault diagnosis, installation and removal of bearings

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18005 Perform fault diagnosis, installation and removal of bearings (Release 1).

Release 1. Supersedes and is equivalent to MEM18005B Perform fault diagnosis, installation and removal of bearings.

Application

This unit of competency defines the skills and knowledge required to perform fault diagnosis, installation and removal of bearings.

It covers performing routine bearing checks during operation and non-operation, diagnosing bearing faults, identifying bearing requirements for replacement or installation, and removing and installing bearings to industry and enterprise standards of quality and safety.

Where diagnostic skills are not required and where straightforward removal and replacement of pre-manufactured bearings is undertaken, unit MEM18055 Dismantle, replace and assemble engineering components should be regarded as sufficient.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Perform routine bearing checks during operation and non-operation**	2.1	Inspect bearing installation and determine task requirements
		2.2	Check bearing installation during operation using standard procedures of listening, feeling and observing, and using appropriate test equipment
		2.3	Check seal condition for seal and wear leaks
		2.4	Check lubricating devices for correct operation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Diagnose bearing faults**	3.1	Perform visual and sensory inspection of bearing arrangement
		3.2	Test bearings for correct operation and malfunction using manufacturers' specifications and diagnostic equipment
		3.3	Identify faulty bearings for replacement
		3.4	Identify causes of failure
		3.5	Take corrective action to avoid recurrences, where necessary
4	**Identify bearing requirements for replacement or installation**	4.1	Inspect bearing installation and determine task requirements
		4.2	Determine operational function of bearings to be installed or replaced
5	**Remove bearings**	5.1	Determine bearing removal techniques and tools
		5.2	Remove bearings from shafts or bearing housings with minimal damage to components
		5.3	Inspect condition of serviceable items using measuring and test equipment
		5.4	Repair serviceable items using engineering techniques, tools and equipment
6	**Install plain bearings**	6.1	Select standard replaceable items for plain, wrapped, flanged, split bush and thrust bearings from manufacturers' parts lists, catalogues or engineering drawings
		6.2	Select installation techniques and tools
		6.3	Size bearings to correct clearance

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	6.4	Cater for lubrication requirements to meet specification and/or application requirements
	6.5	Fit and tension down bearings and run according to manufacturers' recommendations or SOPs
	6.6	Check final clearance, adjustments and lubrication and take corrective action, if necessary
7. **Install anti-friction bearings**	7.1	Select standard replaceable ball and roller anti-friction bearings from manufacturers' catalogues, spare parts lists or interpret from engineering drawing to meet specifications
	7.2	Determine bearing inside/outside diameters from specifications or manufacturers' catalogue and check using measuring instruments
	7.3	Check shafts and housings size for correct fit and clearances
	7.4	Select installation techniques
	7.5	Fit bearings to shafts or housings
	7.6	Seal and cap bearings to specifications, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Plain bearings include one (1) or more of the following:

Rotational plain bearings:

- plain bush
- wrapped bush
- flanged bush
- split bush
- self-lubricating
- thrust bearings for radial
- thrust and combination radial and thrust loading applications

Anti-friction bearings include one (1) or more of the following:

Ball and roller bearings (anti-friction or rolling element bearings):

- self-aligning ball bearings with cylindrical bore
- taper bore (and adaptor sleeve)
- taper bore (and unthreaded adaptor sleeve)
- single row deep groove ball bearings
- magneto bearings (separable ball bearings)
- single row angular contact ball bearings
- double row angular contact ball bearings
- spherical roller bearings including narrow type and C design
- spherical roller bearings (NV, N NS Type)
- double row cylindrical roller bearings
- linear ball bearings
- needle roller bearings
- taper roller bearings
- single thrust ball bearings
- double thrust ball bearings
- single thrust ball bearings with spherical housing washer and seating ring
- spherical roller thrust bearings
- radial bearings with cylindrical, tapered bore (and adaptor or withdrawal sleeve
- associated bearings for radial, axial and combination radial and axial applications

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Installation/removal methods include one (1) or more of the following:	• press • dowel • keys • keeper plate • heat • shrink • hydraulic and mechanical mounting and dismounting tools and associated methods

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18005 Perform fault diagnosis, installation and removal of bearings (Release 1).

Release 1. Supersedes and is equivalent to MEM18005B Perform fault diagnosis, installation and removal of bearings.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18005 Perform fault diagnosis, installation and removal of bearings

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18005 Perform fault diagnosis, installation and removal of bearings (Release 1).

Release 1. Supersedes and is equivalent to MEM18005B Perform fault diagnosis, installation and removal of bearings.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to perform fault diagnosis, installation and removal of bearings
- performing routine bearing checks during operation and non-operation by observing, listening, feeling and the use of appropriate test equipment appropriate to the installation; checking seal for seal and wear leaks and lubricating devices for correct operation
- performing fault diagnosis of bearings using diagnostic techniques and equipment and testing bearings for correct function/malfunction according to manufacturers' specifications
- identifying faulty bearings and causes of failure and taking remedial action to avoid recurrences
- removing bearings from shafts and bearing housings using appropriate fitting techniques and principles, tools, equipment and procedures; and inspecting condition, including measuring bearings and components to specified tolerances and repairing, where appropriate
- installing rotational plain bearings by sizing for correct clearances, lubricating, fitting, tensioning down and running according to specifications and procedures
- installing anti-friction bearings, including ball and roller by determining bearing inside/outside diameters, checking shafts and housings size for correct fit and clearances using appropriate fitting techniques and principles, tools and equipment and seal and cap bearings to specifications, where required
- undertaking numerical operations, calculations and formulae for diagnosing, installing and removal of bearings.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for:
  - checking bearings and seals
  - checking bearing lubrication/lubrication devices
  - determining the appropriate clearances for a range of plain bearings
  - 'sizing' plain bearings
- manufacturer specifications
- engineering principles relating to fault diagnosis, installation and removal of bearings
- reasons for deciding to replace/not replace given bearings
- common causes of bearing failure and their indicators
- lubricants and lubrication requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing fault diagnosis, installation and removal of bearings at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18006 Perform precision fitting of engineering components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18006 Perform precision fitting of engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18006C Repair and fit engineering components.

Application

This unit of competency has been developed for Engineering Tradesperson - Mechanical apprenticeship training and the recognition of trade-level skills in precision fitting and mechanical repair.

It defines the trade-level fitting skills and knowledge associated with manufacturing of new parts/components and fitting mechanical engineering components into assemblies or sub-assemblies to specifications and specified tolerances.

The skills and knowledge described by this unit are applied in occupational and work situations associated with fitting, mechanical trade and maintenance work.

Where the knowledge and skills associated with machining or welding are required, the appropriate units should also be selected.

Where additional or higher marking out skills are required unit MEM12006 Mark off/out (general engineering) should also be selected.

Where the knowledge and skills associated with the installation, removal, repair or replacement of mechanical seals is required unit MEM18012 Perform installation and removal of mechanical seals should also be selected.

Where the knowledge and skills associated with high pressure fluid power seals is required unit MEM18020 Maintain hydraulic system components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work, health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan and prepare to undertake work**	2.1	Assess operation and condition of components against specifications
		2.2	Identify and isolate any faulty or worn components
		2.3	Mark component parts for identification, where required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.4	Determine the cause/s of faults using appropriate engineering principles, techniques, procedures, tools and equipment
		2.5	Determine repair/replacement strategy
3	**Manufacture and/or repair and/or replace faulty components**	3.1	Obtain parts, component and or materials from appropriate sources
		3.2	Source, repair or produce components to meet specifications
		3.3	Inspect components for compliance with specifications
4	**Fit engineering components into assemblies or sub-assemblies**	4.1	Determine the correct fitting requirements and sequence of assembly
		4.2	Prepare and assemble component parts using fastening equipment and methods which ensures conformance to specifications, operational performance, quality and safety
		4.3	Determine lubrication requirements by appropriate means and lubricate, where applicable
		4.4	Perform final adjustments on component assembly to meet operational specifications
5	**Check operation of repaired components/unit**	5.1	Check all components/unit under operational conditions for compliance to specifications
		5.2	Approve any out-of-specification modification/alterations through an appropriate authority and record
		5.3	Perform final modifications/alterations on assembly to meet operational specifications
		5.4	Commission the final assembly and return to service

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engineering principles and fitting techniques include one (1) or more of the following:

- limits of tolerance
- allowances and clearances
- effects of wear, stress and temperature
- types of fits:
  - clearance
  - transition
  - interference
- press fitting methods
- force fits
- shrink and freeze (expansion) fits
- keyed fits
- taper fits
- lateral and radial forces
- datum and centrelines
- broaching
- drilling
- scraping
- filing
- reaming
- tapping
- threading
- simple gland top-ups in non-critical applications
- routine gland maintenance
- jointing
- gaskets

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18006 Perform precision fitting of engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18006C Repair and fit engineering components.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18006 Perform precision fitting of engineering components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18006 Perform precision fitting of engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18006C Repair and fit engineering components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing engineering components visually and dimensionally with appropriate testing and measuring equipment techniques for compliance to specifications
- repairing or replacing faulty components using appropriate tools, equipment and techniques
- assembling components using appropriate fitting techniques and principles
- recording approved modifications/alterations
- inspecting final assembly to check compliance to specifications
- returning the final assembly to service in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools and equipment used to dismantle, repair, assemble and fit engineering components
- consequences of having non-compliant components
- types of modifications/adjustments to components being repaired/fitted
- repair methods
- sources of replacement parts
- techniques for the production of engineering components
- assembly and fitting techniques
- machine backlash/recoil
- measuring equipment
- engineering components - shafts, single and multi-throw crankshafts, cams and journals, bearings and bearing surfaces, and keys

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- squareness, roundness, concentricity, flatness, straightness, surface finish and angular correctness
- purpose, selection criteria and use of gland packing, jointing or gasket materials
- types and application of lubricants
- approval processes for documenting out-of-specification modifications
- commissioning and return to service procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing precision fitting of engineering components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training* Organisations *2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18007 Maintain and repair mechanical drives and mechanical transmission assemblies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18007 Maintain and repair mechanical drives and mechanical transmission assemblies (Release 1).

Release 1. Supersedes and is equivalent to MEM18007B Maintain and repair mechanical drives and mechanical transmission assemblies.

Application

This unit of competency defines the skills and knowledge required to undertake maintenance, diagnose faults and repair drives and transmission assemblies, and undertake final adjustment and commissioning on industrial machinery.

Where levelling and alignment of machines and engineering components is required unit MEM18009 Perform precision levelling and alignment of machines and engineering components should also be selected.

MEM27028 Diagnose and rectify manual transmissions, MEM27014 Diagnose and rectify automatic transmissions and MEM27015 Diagnose and rectify drive line and final drives define the skills and knowledge applicable to mobile plant.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake maintenance checks of mechanical drives and mechanical transmission components**	2.1	Apply principles of mechanical drives, mechanical transmission components and the function of the main parts of the designated mechanical drive/transmission assembly to undertake maintenance checks
		2.2	Check mechanical drive/transmission components for wear, distortion, tensions, misalignment, fatigue, lubrication, slackness, tooth wear, breakages and other

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			related malfunctions using appropriate maintenance principles, techniques, tools and equipment
		2.3	Identify assembly requiring further diagnosis, repair or adjustment and document findings
3	**Adjust mechanical drives and transmission assemblies**	3.1	Determine a suitable adjustment method and requirements from manufacturers' instruction sheets, standard workshop manuals/procedures or similar means
		3.2	Select adjustment tools and equipment according to the type of assembly being serviced
		3.3	Tension, align, balance or adjust drives/transmission components to manufacturers'/site specifications
		3.4	Check drive/transmission assembly after adjustment for correct operation or identify for further diagnosis or repair
		3.5	Complete service report
		3.6	Action further diagnosis or repair requirements
4	**Diagnose faults**	4.1	Read service reports and undertake visual and sensory inspection of the drive/transmission assembly
		4.2	Test diagnostic equipment drive/transmission assembly to manufacturers' specifications, where applicable
		4.3	Localise faults at the component level and identify for repair or replacement
		4.4	Analyse fault causes and develop preventative measures to avoid re-occurrence, document and action by appropriate means
		4.5	Action requirements for repair or replacement
5	**Repair**	5.1	Ascertain task requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
	mechanical drives/ transmission assemblies	5.2 Select tools and equipment according to the type of assembly being serviced
		5.3 Dismantle mechanical drive/transmission using appropriate maintenance principles, techniques, tools, equipment and safe workshop practices
		5.4 Repair serviceable items to manufacturers' specifications and standard workshop practices
		5.5 Select and obtain standard replaceable items from appropriate resources
		5.6 Re-fit component parts to mechanical drive/transmission assembly in accordance with manufacturers'/site specifications
6	**Undertake final adjustment and commissioning**	6.1 Tension, balance, align or adjust drive/transmission components to suit specifications and operational requirements
		6.2 Check drive/transmission assembly after adjustment and operational performance is analysed
		6.3 Commission assembly to specifications
		6.4 Complete service report

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mechanical drive/transmission components include one (1) or more of the following:	• worm and worm wheel • line shafts • plumber blocks • pulleys • sprockets • belts • taper bush assemblies • roller chains • chain drives • mechanical and hydraulic couplings • compression couplings • disc type flexible couplings • spider type • chain couplings • universal joints • bevel gearing • rack and pinion gearing • dog toothed clutches • cone type clutches • expanding shoe type clutches • friction/plate type clutches • centrifugal clutches • toggle action linkages • magnetic clutches • sprag clutches • band type brakes • other associated drive components
Sensory inspection includes one (1) or more of the following:	• vibration • heat • smell • sound • sight

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Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18007 Maintain and repair mechanical drives and mechanical transmission assemblies (Release 1).

Release 1. Supersedes and is equivalent to MEM18007B Maintain and repair mechanical drives and mechanical transmission assemblies.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18007 Maintain and repair mechanical drives and mechanical transmission assemblies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18007 Maintain and repair mechanical drives and mechanical transmission assemblies (Release 1).

Release 1. Supersedes and is equivalent to MEM18007B Maintain and repair mechanical drives and mechanical transmission assemblies.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to maintain and repair mechanical drives and transmission assemblies
- undertaking diagnosis and testing of mechanical drives/transmissions components for wear, lubrication, faults and malfunctions using appropriate tools, equipment and techniques
- identifying assemblies requiring further diagnosis/repair or adjustment and document findings
- determining adjustment requirements of mechanical drives and transmission assemblies from manufacturers' specifications and manuals
- carrying out adjustments to specifications and confirming correct operation
- interpreting service reports and carrying out inspection of drive/transmission assembly visually, sensory and use of diagnostic test equipment to localise faults down to component level and identify for repair or replacement
- dismantling mechanical drive/transmission using appropriate tools and equipment, repairing serviceable items and re-fitting component parts in accordance with manufacturers'/site specifications
- analysing fault causes and developing preventive measures to avoid re-occurrence
- making final adjustments and commissioning to specifications and completing service report.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- uses and characteristics of lubricants
- principles of operation of a range of mechanical drives and transmissions
- techniques, tools and equipment to measure components
- common malfunctions in mechanical drives, transmissions and their components
- procedures for checking and adjusting mechanical drives, transmissions and their components
- preventative measures that can be undertaken to avoid recurrence of the fault/failure.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing mechanical drives and mechanical transmission assemblies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18008 Balance equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18008 Balance equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18008B Balance equipment.

Application

This unit of competency defines the skills and knowledge required to check the balance and balancing of equipment.

Balancing may include the addition or removal of material and all specifications for machine operation and degree of balance to be supplied.

Where wheel and tyre balancing is required unit MEM27029 Maintain wheels and tyres should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check balance**	2.1	Apply principles of equipment balance testing
		2.2	Select most appropriate balancing check procedure
		2.3	Set up component correctly and to site/manufacturer's procedures for balance check
		2.4	Determine balance/out-of-balance and compare to specification requirements
		2.5	Record out-of-balance readings to prescribed procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Balance equipment**	3.1 Apply principles and methods of rigid and/or flexible rotation balancing
	3.2 Use techniques of single and/or multi-plane balancing appropriate to application
	3.3 Balance equipment utilising correct procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• static balancing machines • sophisticated electronic dynamic balancing machines

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18008 Balance equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18008B Balance equipment.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18008 Balance equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18008 Balance equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18008B Balance equipment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to balance equipment
- setting up component to be balanced to site/manufacturer's procedures and determining balance/out-of-balance and comparing to specifications
- operating balance equipment using appropriate techniques safely
- checking for compliance to specifications
- undertaking numerical operations, geometry, calculations and formulae for balancing equipment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of balancing and reasons for testing equipment for balance
- effect of out of balance components on machine/equipment operation and life
- procedures for checking the balance of equipment
- most appropriate procedure to be applied to selected balancing situations and reasons for selection
- procedures for:
  - setting up the component to be balanced
  - operating the balancing equipment
  - recording out-of-balance readings
  - balancing out-of-balance equipment
- specifications of the component to be balanced
- principles and methods of rigid and flexible rotation balancing
- techniques of single and multiple plane balancing
- appropriate balancing technique for given balancing situations and reasons for selection

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- precautions to be taken when adding or removing material to achieve balance.

Assessment Conditions

- Assessors must:
  - have vocational competency in balancing equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18009 Perform precision levelling and alignment of machines and engineering components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18009 Perform precision levelling and alignment of machines and engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18009B Perform levelling and alignment of machines and engineering components.

Application

This unit of competency defines the skills and knowledge required to undertake levelling and alignment measurements/readings and perform levelling and/or alignment and adjustment tasks on machines and engineering components.

It applies to the setting up and use of precision levelling and alignment devices and where all adjustments are performed according to designated procedures in conformance to specifications.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake levelling and alignment measurements/ readings**	2.1	Determine task requirements by inspection of equipment to be levelled and/or aligned
		2.2	Select the correct appropriate levelling and/or alignment procedure
		2.3	Select correct and appropriate levelling or alignment devices/equipment and set up to procedures or manufacturers' recommendation
		2.4	Apply and utilise principles of levelling and alignment
		2.5	Take measurements/readings and record

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Perform levelling and/or alignment tasks**	3.1 Perform levelling realignment calculations using method appropriate for the levelling/alignment application
	3.2 Level equipment to specifications using appropriate tools, equipment and techniques
	3.3 Complete levelling and alignment task to specifications
	3.4 Complete any records required by SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Levelling and/or alignment procedures include one (1) or more of the following:	• face and rim • reverse indicator • use of jacking bolts and shimming material • use of levelling equipment • thermal expansion checks
Equipment includes one (1) or more of the following	• machines • components • assemblies • sub-assemblies

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Levelling and alignment devices/equipment include one (1) or more of the following:	• precision levels • spirit levels • line levels • optical levels • electronic levels • laser levels • dial indicators • special type dial indicator fixtures • magnetic bases • straight edges • feeler gauges • bench centres • vee blocks • plumb line • folding wedges • straight edges • shimpack materials • dumpy levels

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18009 Perform precision levelling and alignment of machines and engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18009B Perform levelling and alignment of machines and engineering components.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18009 Perform precision levelling and alignment of machines and engineering components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18009 Perform precision levelling and alignment of machines and engineering components (Release 1).

Release 1. Supersedes and is equivalent to MEM18009B Perform levelling and alignment of machines and engineering components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to perform levelling and alignment of machines and engineering components
- selecting appropriate levelling and/or alignment procedure in accordance with task requirements
- selecting appropriate levelling and alignment devices/equipment appropriate to the task
- performing levelling/alignment tasks, including levelling or alignment calculations, using appropriate tools, equipment and techniques to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of levelling and alignment
- numerical operations, geometry and calculations/formulae for levelling and alignment
- effects on equipment performance and life of non-level or out-of-alignment components
- techniques, tools, equipment and procedures to carry out the levelling and/or alignment
- reasons for selecting tools, techniques and equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing levelling and alignment of machines and engineering components at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18010 Perform equipment condition monitoring and recording

Modification History

Release 1. Supersedes and is equivalent to MEM18010C Perform equipment condition monitoring and recording

Application

This unit of competency defines the skills and knowledge required to undertake condition monitoring of equipment, including recording the results.

It applies where specialist monitoring activities are undertaken as part of a preventive maintenance or total productive maintenance plan or program and monitoring is undertaken in workshop, laboratory or in situ environment.

Where only routine maintenance checking and diagnostic skills are applied see other appropriate units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake condition monitoring**	2.1	Apply principles and methods of equipment condition monitoring
		2.2	Select appropriate condition monitoring technique to achieve required outcomes
		2.3	Undertake checks safely
		2.4	Plot results and report deviations from specification to appropriate authority and record

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Techniques include one (1) or more of the following:	• built-in systems (software and site displays) • vibration monitors • infra-red and ultraviolet non-destructive testing

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18010C Perform equipment condition monitoring and recording

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18010 Perform equipment condition monitoring and recording

Modification History

Release 1. Supersedes and is equivalent to MEM18010C Perform equipment condition monitoring and recording

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and drawings to perform equipment condition monitoring and recording
- selecting appropriate condition monitoring device/equipment to achieve the required outcomes
- carrying out condition monitoring, plotting results and reporting deviation from specifications according to procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- application of principles and methods for a variety of situations
- appropriate records for a variety of situations.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing equipment condition monitoring and recording at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18011 Shut down and isolate machines/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18011C Shut down and isolate machines/equipment

Application

This unit of competency defines the skills and knowledge required to isolate and shut down machines and equipment and applies to situations that require extensive system knowledge that exclude the straightforward starting/stopping of machinery/equipment through the use of simple switching, including use of emergency switches.

All shutdown and isolation must comply with relevant regulations, Australian Standards and legislative requirements governing isolation and shutdown.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of tools is required unit MEM18001 Use hand tools and unit MEM18002 Use power tools/hand held operations should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006 Organise and communicate information

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Identify any relevant regulations, Australian Standards and legislative requirements governing isolation and shutdown
2	**Shut down and isolate machine/ equipment**	2.1	Determine machine/equipment operational function
		2.2	Undertake shutdown/isolation sequence safely and to SOPs
		2.3	Ensure machine/equipment is depressurised/emptied/de-energised/bled to SOPs
		2.4	Verify safe shutdown/isolation of machine/equipment
		2.5	Install safety/security lock-off devices and signage
		2.6	Confirm shutdown and isolation complies with relevant regulations, Australian Standards and legislative requirements governing isolation and shutdown

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Shut down/isolate includes one (1) or more of the following:	• isolation of mechanical and electrical drives • pipework (pressure) • rotating equipment utilising electrical lock-off isolators • mechanical and power driven valves
Machine/equipment includes one (1) or more of the following:	• manual • semi-automatic • automatic machines of a stand-alone, continuous production or process nature

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18011C Shut down and isolate machines/equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18011 Shut down and isolate machines/equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18011C Shut down and isolate machines/equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents to shut down and isolate machines and equipment
- shutting down machines/equipment ensuring machine/equipment is depressurised/emptied/de-energised/bled according to procedures
- isolating machines/equipment safely in accordance with SOPs, relevant regulations, Australian Standards and legislative requirements governing isolation and shutdown and verifying safe isolation
- installing safety/security lock-off devices and signage.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operational function of the machine/equipment
- shutdown sequence
- procedures and safety precautions for shutting down and isolating the machine/equipment
- procedures for purging/de-energising the machine/equipment and reasons for doing so
- procedures for verifying machine/equipment shutdown and isolation and reasons for verifying
- relevant regulations, Australian Standards and legislative requirements governing isolation and shutdown
- safety/security lock-off devices and signage to be installed
- reasons and procedures for installing lock-off devices and signage
- reasons for ensuring the machine/equipment is left in a clean safe state.

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Assessment Conditions

- Assessors must:
  - have vocational competency in shutting down and isolating machines/equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18012 Perform installation and removal of mechanical seals

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18012 Perform installation and removal of mechanical seals (Release 1).

Release 1. Supersedes and is equivalent to MEM18012B Perform installation and removal of mechanical seals.

Application

This unit of competency defines the skills and knowledge required to check, dismantle, select, reassemble and install a range of mechanical seals.

Skills covered by this unit include the knowledge of appropriate applications for a range of mechanical seals and the ability to remove, select, repair or replace all component parts of the seal.

Where straightforward replacement of seals is required see unit MEM18055 Dismantle, replace and assemble engineering components.

Lubrication requirements are attended to according to suppliers' instructions and recommendations or specifications.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine mechanical seal requirements**	2.1	Apply principles and operational function of mechanical seals and component parts to determine seal requirements
		2.2	Interpret specifications from engineering drawings for new mechanical seal installation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Dismantle mechanical seal installations**	3.1	Examine mechanical seal assembly and select appropriate dismantling techniques, tools and equipment to suit work requirements
		3.2	Dismantle mechanical seal assembly
		3.3	Examine all component parts for wear, including housing, shafts, primary sealing elements, secondary seals and seat assembly, to determine need for repair or replacement
		3.4	Repair serviceable items by appropriate means
		3.5	Remove primary sealing elements and secondary seals for replacement, where required
4	**Select replacement items and reassemble mechanical seal installations**	4.1	Select replacement items from appropriate sources or sample using SOPs
		4.2	Fit mechanical seal components, including seal head, secondary seals, seat assembly, shaft and housing
		4.3	Tension and adjust mechanical seal assembly to manufacturers' specifications
		4.4	Test mechanical seal assembly using appropriate methods for compliance with specifications and operational performance

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Seals include one (1) or more of the following:	• carbon • stellite • neoprene • other associated materials
Mechanical seals include (1) one or more of the following:	• pusher • non-pusher • conventional • balanced • unbalanced • cartridge • single spring • multiple spring

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18012 Perform installation and removal of mechanical seals (Release 1).

Release 1. Supersedes and is equivalent to MEM18012B Perform installation and removal of mechanical seals.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18012 Perform installation and removal of mechanical seals

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18012 Perform installation and removal of mechanical seals (Release 1).

Release 1. Supersedes and is equivalent to MEM18012B Perform installation and removal of mechanical seals.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents for determining mechanical seal requirements
- dismantling mechanical seal assemblies used across different sealing applications using appropriate tools, equipment and techniques
- examining all component parts for wear and determining the need for repair/replacement and selecting replacement parts according to specifications
- reassembling/repairing mechanical seal installations using appropriate tools and equipment
- selecting and fitting replacement parts
- measuring components to specified tolerances
- adjusting mechanical seal tensions and checking for compliance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of operation of mechanical seals
- components and function of a range of mechanical seal designs
- installation specifications and procedures
- techniques/tools for removing primary sealing elements and secondary seals from mechanical seals
- reasons for selection mechanical seal
- specified mechanical seal tension
- testing mechanical seals

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- techniques, tools and equipment to measure components.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing installation and removal of mechanical seals at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18013 Perform gland packing

Modification History

Release 1. Supersedes and is equivalent to MEM18013B Perform gland packing

Application

This unit of competency defines the skills and knowledge required to inspect glands and gland packing and remove and replace or top up gland packing. It applies to packing for high or low temperatures and pressures, solids, gases and liquids.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where skills that relate to maintaining simple gland top-ups in non-critical applications and routine gland maintenance are required unit MEM18006 Perform precision fitting of engineering components should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Inspect glands and gland packing**	2.1	Apply principles of gland packing
		2.2	Inspect stuffing box assembly and gland packing and determine packing requirements
3	**Remove and replace or top up gland packing**	3.1	Extract or remove gland packing using appropriate engineering techniques, tools and equipment
		3.2	Select correct and appropriate gland packing and cut to size and shape to conform to application and/or specifications
		3.3	Fill the stuffing box with packing material and reassemble the gland using site procedures or manufacturers' recommended procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Packing includes one (1) or more of the following:	• flat • ribbon • round • square • moulded • dry • lubricated
Packing material includes one (1) or more of the following:	• carbon • hemp • rubber • leather • Teflon • felt • neoprene

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18013B Perform gland packing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18013 Perform gland packing

Modification History

Release 1. Supersedes and is equivalent to MEM18013B Perform gland packing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other reference material to perform gland packing
- inspecting stuffing box assembly and gland packing and determining task requirements
- extracting or removing gland packing using appropriate tools, equipment, techniques and procedures to specifications
- replacing gland packing material, cutting to size and shaping to conform to application and/or specifications
- topping up stuffing box with packing material and reassembling the gland according to procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of gland packing
- tools, techniques and equipment required to remove gland packing
- various types of gland packing
- reasons for selecting gland packing
- methods of cutting gland packing to size and shape
- reassembling procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing gland packing at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18014 Manufacture press tools and gauges

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18014 Manufacture press tools and gauges (Release 1).

Release 1. Supersedes and is equivalent to MEM18014B Manufacture press tools and gauges.

Application

This unit of competency defines the skills and knowledge required to manufacture and trial press tools and gauges.

Manufacture of the tooling includes preparing to manufacture including assembly of the tooling components and trialling all types of production tooling.

Where brazing skills are required unit MEM05006 Perform brazing and/or silver soldering should also be selected.

Where manufacture of cavity dies is required unit MEM18097 Manufacture cavity dies should also be selected.

This unit does not cover any welding that may be associated with manufacturing press tools and gauges. If welding skills are required, appropriate welding units must also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 8

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM07005	Perform general machining
MEM07006	Perform lathe operations
MEM07007	Perform milling operations
MEM07008	Perform grinding operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12003	Perform precision mechanical measurement
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18015	Maintain tools and dies
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.4	Identify job requirements from specifications, drawings, prints, job sheets, work instructions or sample component
2	**Prepare to manufacture tool or gauge**	2.1	Plan and develop tooling type and design with reference to customer's specifications (written or verbal) for numbers, finish, quality and material
		2.2	Assess production machine to be used to produce components and consider in tooling design
		2.3	Determine selected production machine mounting requirements to ensure any special or additional provisions are incorporated in tooling design
3	**Manufacture tooling**	3.1	Select and obtain appropriate materials to meet tooling requirements for strength, durability, component finish, heat treatment qualities, where necessary, and account for materials availability
		3.2	Test selected material for hardness, as appropriate to aid selection of machine tools, hand tools and hand held power tools to be used to fashion or shape tooling components
		3.3	Develop a plan to sequence and stage manufacturing process, including establishing datum, mark out, rough out (machine or fashion), stress relieve/heat treat, finish size, fashion and fit, and assemble componentry
4	**Perform machining operations**	4.1	Select appropriate machines and machining process from a range of standard tool room machines to shape/produce tooling components to specifications
5	**Use hand and hand held power tools**	5.1	Select a range of hand and hand held power tools and use to fashion/manufacture tooling components to specification

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.2 Produce components sample or section for testing, where practical
6 **Assemble tooling components and trial tooling**	6.1 Check components and fit/assemble to specifications using acceptable tool making techniques and procedures
	6.2 Check first-off component with precision instruments against specification
	6.3 Modify tooling to produce components to specification, as necessary
	6.4 Re-trial modified tooling and produce component
	6.5 Verify compliance to specification and report according to SOPs
	6.6 Record all deviations or modifications to original tooling design, prints or plans and report

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tooling includes one (1) or more of the following:	• press tools • jigs • fixtures • gauges

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- special purpose machines and equipment

Standard tool room machines include one (1) or more of the following:

- lathes
- mills
- copy/duplicator
- grinders
- electrical discharge machining (EDM) and wire cut equipment
- precision measurement machines and equipment

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18014 Manufacture press tools and gauges (Release 1).

Release 1. Supersedes and is equivalent to MEM18014B Manufacture press tools and gauges.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18014 Manufacture press tools and gauges

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18014 Manufacture press tools and gauges (Release 1).

Release 1. Supersedes and is equivalent to MEM18014B Manufacture press tools and gauges.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, prints and/or sample components to manufacture press tools and gauges
- planning and developing tooling type with reference to tooling drawings, prints or plans
- incorporating mounting requirements into tooling design and confirming against customer specifications
- manufacturing tooling by selecting and testing appropriate materials for hardness to meet requirements
- preparing a sequential plan for the manufacture of the required tooling
- shaping/producing tooling components to specifications using appropriate machines and machining processes
- using hand and hand held power tools to fashion/manufacture tooling components to specifications
- assembling and fitting tooling components using appropriate tool making techniques and procedures
- producing first-off component and checking for compliance to specifications
- modifying and re-trialling tooling, as required and verifying compliance to specifications
- recording all deviations or modifications to original tool design and reporting according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- customers' tooling requirements, including type of tooling to be manufactured
- machine(s) in which the tooling is to be used

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- tooling design concept in terms of customer specifications and proposed production machine(s)
- performance requirements of the tooling
- method of mounting the tooling in the production machine into which it is to be installed
- physical properties of a range of tool steels
- appropriate materials for each component of the tooling to be produced
- reasons for selecting the chosen materials in terms of strength, durability, component finish, heat treatment requirements and availability
- procedures for:
  - hardness testing materials and the effect of material hardness on machinability of the material
  - documenting plans for the manufacture of tooling
  - fitting/assembling the tooling components
  - reporting/recording the conformance of the component/product produced by the tooling to specifications
  - recording/reporting modifications and/or alterations to tooling design
- appropriate machinery and tools to be used to fashion or shape tooling components and reasons for selection
- reasons for establishing a sequential plan for the manufacture of tooling
- hand and hand held power tools to be used to fashion/manufacture the required tooling components and reasons for selection
- precautions to be taken when fitting/assembling tooling components
- appropriate precision instruments for checking the components produced
- specifications of the finished product
- causes of any non-conformance to specification
- tool making techniques/procedures to be applied to return the tooling to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in manufacturing press tools and gauges at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18015 Maintain tools and dies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18015 Maintain tools and dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18015B Maintain tools and dies.

Application

This unit of competency defines the skills and knowledge required to maintain tools and dies.

It covers identifying and analysing defects in tooling, disassembling and assessing tooling components, manufacturing or repairing tooling components to conform to specifications, and assembling tooling components. Potential production/maintenance problems are also identified.

Where simple maintenance not requiring precision repair is required unit MEM18006 Perform precision fitting of engineering components should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM07005	Perform general machining
MEM07006	Perform lathe operations
MEM07007	Perform milling operations
MEM07008	Perform grinding operations
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Identify and analyse defects in tooling**	2.1	Determine defects from production components produced, production reports or tool inspections
		2.2	Plan sequence of maintenance operations
3	**Disassemble and assess tooling components**	3.1	Disassemble tooling and assess condition of components against prints, drawings and manufacturers' drawings
		3.2	Replace/recondition worn/damaged parts
4	**Manufacture/repair and assemble tooling components**	4.1	Obtain materials to meet tooling requirements
		4.2	Select and use appropriate hand and hand held power tools
		4.3	Choose appropriate machining process from a range of standard tool room machines
		4.4	Set machining parameters to produce components to specification
		4.5	Initiate heat treatment according to specification, where appropriate
		4.6	Check tooling components and assemble in conformance with specifications and procedures
		4.7	Check production components to ensure compliance to specifications, as required
5	**Identify potential production/ maintenance problems**	5.1	Identify and record conditions leading to tooling failure
		5.2	Identify recurrent faults and initiate solutions

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tooling includes one (1) or more of the following:	• press tools • plastic moulds • forging dies • die casting • jigs • fixtures • gauges
Tool room equipment includes one (1) or more of the following:	• lathes • mills • grinders • hand and power tools used for precision work

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18015 Maintain tools and dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18015B Maintain tools and dies.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18015 Maintain tools and dies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18015 Maintain tools and dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18015B Maintain tools and dies.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings and sample products/components to maintain tools and dies
- examining defective tooling for breakage, wear and defects requiring precision repair
- disassembling the defective tooling in accordance with acceptable tool making techniques and procedures and marking worn/damaged components for repair or replacement
- obtaining appropriate materials for manufacture of replacement tooling components and testing for hardness
- using appropriate hand and hand held power tools to fashion/manufacture tooling components to specifications and utilising sample components or sections to test tooling components being manufactured
- shaping and producing the tooling components to specifications using appropriate machines and machine processes and initiating heat treatment, where required
- assembling and fitting all tooling components to specifications using acceptable tool making techniques and procedures
- using precision instruments to check the first-off component/product for compliance to specifications
- recording the conditions that lead to the failure of a given set of tooling and initiating design modifications/alterations to rectify recurring faults or failure.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- common tooling defects from a range of sample products/components and reasons and probable causes of tooling failure
- reasons for establishing a sequential plan for the repair/maintenance of defective tooling
- procedures for:

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  - documenting plans for the repair/maintenance of defective tooling
  - disassembling defective tooling
  - identifying worn/damaged tooling and components for repair or replacement
  - obtaining/selecting the chosen materials in terms of strength, durability, component finish, heat treatment requirement, availability and reasons for selection
  - hardness testing materials
  - initiating the heat treatment of tool steels and components and heat treatment requirements to achieve specified hardness
  - fitting/assembling the tooling components and precautions to be taken
  - fitting/assembling the tooling components
  - documenting the chosen mode of tooling failures
  - initiating modifications/alterations to tooling design
- specifications of all tooling components
- precision instruments to be used to check tooling components for conformance to specification and reasons for selection
- reasons for deciding to repair or replace worn/damaged components
- appropriate materials, including physical properties for each component of the tooling to be replaced
- hand and hand held power tools to be used to fashion/manufacture the required tooling components and reasons for selection
- appropriate machines and machining processes to shape/produce the required tooling components and reasons for selection
- effect of machining parameters on the surface finish and tolerances achievable from machining processes for given machining tasks and specifications
- reasons for heat treating the tool steel in accordance with heat treatment procedures and specifications
- appropriate precision instruments for checking the components produced
- specifications of the finished product
- common causes of tooling failure and conditions leading to the failure of a given set of tooling
- previous faults with the given set of tooling
- any commonalities of causes of failures or trends/events associated with tooling failure and proposed solutions for a range of recurrent faults that may occur in tooling and reasons for selection.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining tools and dies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.

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- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18016 Analyse plant and equipment condition monitoring results

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18016 Analyse plant and equipment condition monitoring results (Release 1).

Release 1. Supersedes and is equivalent to MEM18016B Analyse plant and equipment condition monitoring results.

Application

This unit of competency defines the skills and knowledge required to analyse condition monitoring results and develop recommendations based on the analysis. The data analysed is generated by a continuous plant and equipment condition monitoring program.

Where production of formal reports is required unit MEM16010 Write reports should also be selected.

Where production of reports of a technical nature is required unit MEM16014 Report technical information should also be selected.

Where equipment condition monitoring and recording only is required to be performed then unit MEM18010 Perform equipment condition monitoring and recording should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12025	Use graphical techniques and perform simple statistical computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Analyse condition monitoring results**	2.1	Examine and analyse records/graphs/results of condition monitoring and identify problem areas
		2.2	Undertake necessary calculations/computations to determine indications of malfunction or impending failure
		2.3	Undertake appropriate reports/determinations of analyses

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	to prescribed site SOPs
3 **Develop recommendations**	3.1 Develop recommendations based on previous history, results, specifications and any relevant legislative requirements
	3.2 Report recommendations to appropriate authority

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18016 Analyse plant and equipment condition monitoring results (Release 1).

Release 1. Supersedes and is equivalent to MEM18016B Analyse plant and equipment condition monitoring results.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18016 Analyse plant and equipment condition monitoring results

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18016 Analyse plant and equipment condition monitoring results (Release 1).

Release 1. Supersedes and is equivalent to MEM18016B Analyse plant and equipment condition monitoring results.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining results of condition monitoring of plant and equipment and examining and analysing records/graphs/results and identifying areas of concern
- determining indications of malfunctions or impending failure by performing calculations to analyse condition monitoring data
- reporting recommendations to the appropriate authority in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operational specifications of the plant/equipment being monitored and any trends and/or deviations
- numerical operations and calculations/formulae for data analysis within the scope of this unit
- procedures for reporting the analysis of condition monitoring data
- previous history of the plant/equipment being monitored
- relevant legislative requirements
- recommendations and reasons with respect to action to be taken
- expected effect of the recommendations on the operational performance of the plant/equipment
- procedures for reporting recommendations and authority/person to whom the recommendations are to be made.

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Assessment Conditions

- Assessors must:
  - have vocational competency in analysing plant and equipment conditioning monitoring results at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18017 Modify mechanical systems and equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18017 Modify mechanical systems and equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18017C Modify mechanical systems and equipment.

Application

This unit of competency defines the skills and knowledge required to determine the requirements of the modification, undertake the modification and evaluate the modified mechanical system/equipment.

It applies to significant modifications to plant and equipment that lead to desired changes in performance of existing equipment or the installation of new or replacement equipment.

Maintenance schedules are required for mechanical machines and systems, including stationary, stand-alone machines, and manual, semi-automatic and automatic process systems.

Where drafting skills to Australian Standard 1100 Technical drawing is required unit MEM09003 Prepare basic engineering drawing should also be selected.

Where the selection and use of precision mechanical measurements is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where interpretation of technical specifications is required unit MEM16012 Interpret technical specifications and manuals should also be selected.

Where minor modifications are required to be performed unit MEM18055 Dismantle, replace and assemble engineering components and MEM18006 Perform precision fitting of engineering components, should also be selected as appropriate.

Where balancing equipment is required unit MEM18008 Balance equipment should also be selected.

Where equipment condition monitoring and recording is required unit MEM18010 Perform equipment condition monitoring and recording should also be selected.

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Where analysing of plant and equipment condition monitoring results is required unit MEM18016 Analyse plant and equipment condition monitoring results should also be selected.

Where graphical techniques and simple statistical computations are required, unit MEM12025 Use graphical techniques and perform simple statistical computations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18005	Perform fault diagnosis, installation and removal of bearings
MEM18006	Perform precision fitting of engineering components
MEM18007	Maintain and repair mechanical drives and mechanical transmission assemblies
MEM18009	Perform precision levelling and alignment of machines and engineering components

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MEM18011	Shut down and isolate machines/equipment
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan modification requirements**	2.1	Analyse maintenance reports and system output information
		2.2	Identify defective components, sub-assemblies and design faults
		2.3	Develop corrective action plan
3	**Undertake standard modifications to mechanical systems and equipment**	3.1	Identify modification options for overcoming parts failures and design faults
		3.2	Select replacements for failed components and sub-assemblies from manufacturers' catalogue
		3.3	Develop modification design in conjunction with and approved by appropriate authority
		3.4	Record modification according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

4	**Evaluate modified mechanical system/equipment**	4.1	Evaluate alterations for effectiveness and efficiency
		4.2	Report and record effectiveness/efficiency
		4.3	Check results against specifications
		4.4	Recommend additional modification/changes, where required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Analysis includes:

- interpretation and integration of data from consultations, process control instrumentation, and specifications and manuals

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18017 Modify mechanical systems and equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18017C Modify mechanical systems and equipment.

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Assessment Requirements for MEM18017 Modify mechanical systems and equipment

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18017 Modify mechanical systems and equipment (Release 1).

Release 1. Supersedes and is equivalent to MEM18017C Modify mechanical systems and equipment.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining modification requirements by obtaining and analysing relevant maintenance reports, production data, specifications, drawings, circuits and conditioning monitoring data and developing corrective action plan in accordance with SOPs
- inspecting plant/equipment for correct location, alignment, operation, performance and conformance to specifications and identifying modification options to overcome parts failure and design faults
- developing modification/s to plant and equipment which lead to desired changes in performance in conjunction with, and approved by, appropriate authority
- recording approved modifications in accordance with procedures and preparing and authorising drawings of the modified components and/or sub-assemblies
- operating and monitoring performance of modified plant/equipment to ensure compliance with the required performance specifications
- recording/reporting efficiency/effectiveness of the modifications undertaken and recommending further modifications, where required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- desired changes in performance of the plant/equipment
- specifications of the plant/equipment and its performance requirements
- procedures for:
  - inspecting the plant/equipment against specifications
  - documenting the proposed modifications to the plant/equipment

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  - modifying and authorising changes to drawings of components and/or sub-assemblies, and plant/equipment
  - recording modifications undertaken
  - checking the operation of the modified plant/equipment against required performance specifications
  - reporting/recording the effectiveness/efficiency of the modifications
- effect of defective components, sub-assemblies and design faults on the performance of plant/equipment
- reasons and action to be taken to achieve the desired changes in performance
- authority from whom approval to undertake the proposed modifications is to be obtained
- typical part failure modes and the causes and action to be taken to correct part failures and design faults
- options for modifying the plant/equipment for given part failures and/or design faults
- replacement parts from manufacturers'/suppliers' catalogues for given components and/or sub-assemblies
- tests to be undertaken to check the performance of the modified plant/equipment
- engineering design and drawing skills associated with modifying mechanical systems and equipment
- numerical operations, geometry and calculations/formulae.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying mechanical systems and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18018 Maintain pneumatic system components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18018 Maintain pneumatic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18018C Maintain pneumatic system components.

Application

This unit of competency defines the skills and knowledge required to check pneumatic system components, identify and repair or replace faulty components.

Pneumatic system components are identified and inspected and assessed using fluid power principles to predetermined specifications interpreted from data sheets and circuits diagrams.

Where straightforward removal/replacement of components from a pneumatic system is required unit MEM18055 Dismantle, replace and assemble engineering components and unit MEM18071 Connect and disconnect fluid conveying system components, should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check pneumatic system components**	2.1	Identify the characteristics and operational function of each system component
		2.2	Inspect and test the operational function of each component
		2.3	Assess correct operation of each component against specifications
3	**Identify, repair**	3.1	Localise faulty system components and confirm

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
or replace faulty pneumatic system components	malfunction by inspection and testing using fluid power principles, procedures and safety requirements
	3.2 Dismantle faulty system components and repair to manufacturers'/site specifications
	3.3 Select replacement parts from appropriate sources
	3.4 Reassemble system components and verify for correct operation and test against specifications
	3.5 Confirm correct operation of the pneumatic system according to SOPs
	3.6 Adopt appropriate follow-up procedures
	3.7 Complete service reports

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Pneumatic system components include one (1) or more of the following:	• static and dynamic seals • linear and semi-rotary actuators • pressure control valves • directional control valves • flow control valves • normally open and closed timers • counters • pneumatic motors

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- fluid conductors
- other associated equipment

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18018 Maintain pneumatic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18018C Maintain pneumatic system components.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18018 Maintain pneumatic system components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18018 Maintain pneumatic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18018C Maintain pneumatic system components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to maintain pneumatic system components
- inspecting and testing pneumatic system components to predetermined specifications using fluid power principles
- checking component parts visually and dimensionally for compliance to specification and, where appropriate, marking faulty parts for repair, replacement or adjustment
- dismantling and repairing faulty system components, including selecting replacement parts from manufacturers'/suppliers' catalogues to site or manufacturers' specifications
- assembling and testing pneumatic components for correct operation and compliance to specifications
- checking the operation of the pneumatic system for compliance to specifications
- completing service reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- full range of pneumatic system components and characteristics/operational function of each component
- procedures and equipment for inspecting and testing pneumatic system components
- specifications of each pneumatic system component
- faulty system components and causes of faulty components
- individual components within the pneumatic system
- procedures for repairing pneumatic system components

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- procedures for checking pneumatic system operation
- follow-up procedures with respect to repaired/replaced pneumatic system components
- reporting/recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining pneumatic system components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18019 Maintain pneumatic systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18019 Maintain pneumatic systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18019B Maintain pneumatic systems.

Application

This unit of competency defines the skills and knowledge required to undertake preventive maintenance checks/adjustments on pneumatic systems, and fault-find, replace, repair or overhaul and recommission pneumatic systems.

It applies to pneumatic systems in industrial and mobile plant and equipment used in manufacturing, agricultural, forestry, mining and transport industries.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18018	Maintain pneumatic system components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventative maintenance checks/adjustments on pneumatic systems**	2.1	Identify system components, assemblies or sub-assemblies and prepare for inspection/preventative maintenance
		2.2	Carry out visual inspection and testing with appropriate test equipment according to fluid power principles, procedures and safety requirements
		2.3	Perform scheduled preventative maintenance tasks, including obvious repairs and adjustments, according to manufacturers' specification using fluid power techniques/practices
3	**Undertake**	3.1	Identify designated pneumatic system components and

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	fault-finding on pneumatic systems		carry out visual inspection of the system for the collection of fault-finding data
		3.2	Consult system operator and collect additional data, where appropriate
		3.3	Check maintenance reports and preventative maintenance schedules and review for additional fault-finding data
		3.4	Undertake checks and tests
		3.5	Identify and verify faults and malfunctions
		3.6	Document or report faults and malfunctions to designated personnel using appropriate procedures
4	**Repair and/or overhaul pneumatic power system**	4.1	Isolate system or sub-assembly and discharge residue pressure safely in accordance with prescribed procedures or check for correct isolation
		4.2	Tag isolated system or sub-assembly according to SOPs
		4.3	Remove component or sub-assembly from system
		4.4	Dismantle components or sub-assemblies, examine and verify for replacement, repair or overhaul
		4.5	Select replacement items from appropriate sources
		4.6	Rectify faulty items
		4.7	Refit component or sub-assembly items to equipment and test for compliance against specifications
5	**Recommission pneumatic system**	5.1	Re-commission system or sub-assembly according to prescribed procedures and specifications
		5.2	Verify correct operation of the system using fluid power principles and system application techniques
		5.3	Instigate appropriate follow-up procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.4 Update maintenance records/service reports

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Pneumatic systems include one (1) or more of the following:	• pneumatic assemblies/sub-assemblies • stationary/mobile equipment • pneumatic power tools
Test equipment includes one (1) or more of the following:	• leak testers • escape rate gauges • hand held pressure testers • other appropriate equipment
Rectify includes one (1) or more of the following:	• replacement • repair and/or reuse of components

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18019 Maintain pneumatic systems (Release 1).

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Release 1. Supersedes and is equivalent to MEM18019B Maintain pneumatic systems.

Links

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Assessment Requirements for MEM18019 Maintain pneumatic systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18019 Maintain pneumatic systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18019B Maintain pneumatic systems.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting maintenance reports and preventative maintenance schedules
- inspecting and testing pneumatic system components, assemblies or sub-assemblies and carrying out preventative maintenance tasks to predetermined specifications using fluid power principles, tools and equipment
- checking component parts visually and dimensionally for compliance to specification and, where appropriate, marking faulty parts for repair, replacement or adjustment
- consulting with system operator and carrying out visual inspection of pneumatic system and components with respect to the fault being investigated and other anomalies
- undertaking fault-finding and verifying and confirming faults/malfunctions
- isolating and depressurising system or sub-assembly, confirming and using appropriate tagging system according to SOPs
- removing, dismantling and repairing/overhauling faulty system components or sub-assembly, including selecting replacement parts from manufacturers'/suppliers' catalogues, to site or manufacturers' specifications
- assembling pneumatic components or sub-assembly for compliance to specifications, refitting items to equipment and testing for correct operation
- recommissioning pneumatic system/sub-assembly to specifications and verifying correct operation and initiating any follow-up procedures
- updating and completing maintenance records and/or service reports.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pneumatic principles

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- manufacturers' specifications and structure of common pneumatic system components and their constituent parts
- pneumatic system/component faults that can be determined by visual inspection
- application of common pneumatic system/component test equipment
- scheduled preventative maintenance tasks
- common pneumatic system and component faults and any previous faults
- any previous maintenance carried out on the pneumatic system/components
- typical checks/tests that can be carried out on pneumatic systems/components and their application
- pneumatic system/component tests and testing techniques
- apparent faults/malfunctions
- documentation/reporting requirements with respect to verified faults/malfunctions
- procedures for initiating repair and/or overhaul of the pneumatic system
- procedures for isolating and depressurising pneumatic systems
- tagging requirements for isolated systems
- appropriate repair/overhaul procedures of pneumatic components
- pneumatic system operational specifications and system recommissioning procedures
- any appropriate follow-up maintenance or operational checks
- maintenance recording/reporting requirements and consequences of inaccurate or incomplete recording/reporting of maintenance/service activities.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining pneumatic systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18020 Maintain hydraulic system components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18020 Maintain hydraulic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18020B Maintain hydraulic system components.

Application

This unit of competency defines the skills and knowledge required to check hydraulic system components, identify, and repair or replace faulty components.

Hydraulic system components are identified and inspected and assessed using fluid power principles to predetermined specifications interpreted from data sheets and circuits diagrams.

Where straightforward removals/replacement of components from a hydraulic system is required unit MEM18055 Dismantle, replace and assemble engineering components and unit MEM18071 Connect and disconnect fluid conveying system components, should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check hydraulic system components**	2.1	Identify the characteristics and operational function of each system component
		2.2	Inspect and test the operational function of each component
		2.3	Assess correct operation of each component against specifications
3	**Identify and**	3.1	Localise faulty system components and confirm

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
repair or replace faulty hydraulic system components	malfunction by inspection and testing using fluid power principles, procedures and safety requirements
	3.2 Dismantle faulty system components and repair to manufacturers'/site specifications
	3.3 Select replacement parts from appropriate sources
	3.4 Reassemble system components and test for correct operation and assessment against specifications
	3.5 Confirm correct operation of the hydraulic system according to SOPs
	3.6 Adopt appropriate follow-up procedures
	3.7 Complete service reports

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hydraulic system components include one (1) or more of the following:	• static and dynamic seals • linear and semi-rotary actuators • fixed and variable displacement pumps • pressure, directional and flow control valves • hydraulic motors • reservoirs • contamination control components (filtration)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- fluid conductors/fittings
- other associated equipment

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18020 Maintain hydraulic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18020B Maintain hydraulic system components.

Links

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Assessment Requirements for MEM18020 Maintain hydraulic system components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18020 Maintain hydraulic system components (Release 1).

Release 1. Supersedes and is equivalent to MEM18020B Maintain hydraulic system components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to maintain hydraulic system components
- inspecting and testing hydraulic system components to predetermined specifications using fluid power principles
- checking component parts visually and dimensionally for compliance to specification and, where appropriate, marking faulty parts for repair, replacement or adjustment
- dismantling and repairing faulty system components, including selecting replacement parts from manufacturers'/suppliers' catalogues, to site or manufacturers' specifications
- assembling and testing hydraulic components for correct operation and compliance to specifications
- checking the operation of the hydraulic system for compliance to specifications
- completing service reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- Full range of hydraulic system components characteristics/ operational function of each component
- procedures and equipment for inspecting and testing hydraulic system components
- specifications of each hydraulic system component
- faulty system components and causes of faulty components
- individual components within the hydraulic system
- procedure for repairing hydraulic system components

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- procedures for checking hydraulic system operation
- follow-up procedures with respect to repaired/replaced hydraulic system components
- reporting/recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining hydraulic system components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18021 Maintain hydraulic systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18021 Maintain hydraulic systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18021B Maintain hydraulic systems.

Application

This unit of competency defines the skills and knowledge required to undertake preventive maintenance checks/adjustments on hydraulic systems, and fault-find, replace, repair or overhaul and recommission hydraulic systems.

Where the skills and knowledge required relate to mobile plant in agriculture, forestry, rail, marine and other transport operations unit MEM27017 Maintain, fault find and rectify hydraulic systems for mobile plant should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18020	Maintain hydraulic system components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventative maintenance checks/adjustments on hydraulic systems**	2.1	Identify system components, assemblies or sub-assemblies and prepare for inspection/preventative maintenance
		2.2	Carry out visual inspection and testing with appropriate test equipment according to fluid power principles, procedures and safety requirements
		2.3	Perform scheduled preventive maintenance tasks, including obvious repairs and adjustments, according to manufacturers' specifications using fluid power techniques/practices
3	**Undertake fault**	3.1	Identify designated hydraulic system components and

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	finding on hydraulic systems		carry out a visual inspection of the system for the collection of fault-finding data
		3.2	Consult system operator and collect additional data, where appropriate
		3.3	Check maintenance reports and preventative maintenance schedules and review for additional fault-finding data
		3.4	Undertake checks and tests
		3.5	Identify and verify faults and malfunctions
		3.6	Document or report faults and malfunctions to designated personnel using appropriate procedures
4	**Repair and/or rectify hydraulic system**	4.1	Isolate system or sub-assembly and discharge residue pressure safely in accordance with prescribed procedure and check for correct isolation
		4.2	Tag isolated system or sub-assembly according to SOPs
		4.3	Remove components or sub-assembly from system
		4.4	Dismantle components or sub-assemblies, examine and verify for replacement, repair or overhaul
		4.5	Select replacement items from appropriate sources
		4.6	Rectify faulty items
		4.7	Refit component or sub-assembly items to equipment and test for correct operation against specifications
5	**Recommission hydraulic system**	5.1	Recommission system or sub-assembly according to prescribed procedures and specifications
		5.2	Verify correct operation of the system using fluid power principles and system application techniques
		5.3	Instigate appropriate follow-up procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.4 Update maintenance records/service reports

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• leak testers • escape rate gauges • hand held pressure testers • other appropriate equipment
Rectify includes one (1) or more of the following:	• replacement • repair and/or reuse of components

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18021 Maintain hydraulic systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18021B Maintain hydraulic systems.

Links

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Assessment Requirements for MEM18021 Maintain hydraulic systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18021 Maintain hydraulic systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18021B Maintain hydraulic systems.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting maintenance reports and preventative maintenance schedules
- inspecting and testing hydraulic system components, assemblies or sub-assemblies and carrying out preventative maintenance tasks to predetermined specifications using fluid power principles, tools and equipment
- consulting with system operator and carrying out visual inspection of hydraulic system and components with respect to the fault being investigated and other anomalies
- undertaking fault-finding and verifying and confirming faults/malfunctions
- checking component parts visually and dimensionally for compliance to specification and, where appropriate, marking faulty parts for repair, replacement or adjustment
- isolating and depressurising system or sub-assembly, confirming and using appropriate tagging system according to SOPs
- removing, dismantling and repairing/overhauling faulty system components or sub-assembly, including selecting replacement parts from manufacturers'/suppliers' catalogues, to site or manufacturers' specifications
- assembling hydraulic components or sub-assembly for compliance to specifications, refitting items to equipment and testing for correct operation
- recommissioning hydraulic system/sub-assembly to specifications and verifying correct operation and initiating any follow-up procedures
- updating and completing maintenance records and/or service reports.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- hydraulic principles

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- manufacturers' specifications and structure of common hydraulic system components and their constituent parts
- hydraulic system/component faults that can be determined by visual inspection
- application of common hydraulic system/component test equipment
- scheduled preventative maintenance tasks
- common hydraulic system and component faults and any previous faults
- any previous maintenance carried out on the hydraulic system/components
- typical checks/tests that can be carried out on hydraulic systems/components and their application
- hydraulic system/component tests and testing techniques
- apparent faults/malfunctions
- documentation/reporting requirements with respect to verified faults/malfunctions
- procedures for initiating repair and/or overhaul of the hydraulic system
- procedures for isolating and depressurising hydraulic systems
- tagging requirements for isolated systems
- appropriate repair/overhaul procedures of hydraulic components
- hydraulic system operational specifications and system recommissioning procedures
- any appropriate follow-up maintenance or operational checks
- maintenance recording/reporting requirements and consequences of inaccurate or incomplete recording/reporting of maintenance/service activities.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining hydraulic systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18022 Maintain fluid power controls

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18022 Maintain fluid power controls (Release 1).

Release 1. Supersedes and is equivalent to MEM18022B Maintain fluid power controls.

Application

This unit of competency defines the skills and knowledge required to install and repair and/or rectify fluid power controls, and adjust fluid power system control sequence and operation.

It covers fault-finding of fluid power systems control circuits, maintaining and repairing or replacing system control components, and checking and adjusting the sequence of fluid power system controls. System circuit/components are identified, traced, inspected and operational function is assessed and verified using fluid power principles to predetermined specifications interpreted from data sheets and circuit diagrams.

Where skills beyond the sequencing of programmable logic controllers (PLCs) are required unit MEM10004 Enter and change programmable controller operational parameters and unit MEM10005 Commission programmable controller programs, should be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Plus, one or more of the following, including their prerequisites:

MEM18019	Maintain pneumatic systems
MEM18021	Maintain hydraulic systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Install/replace fluid power systems and**	2.1	Interpret and apply fluid power control principles and system/circuit diagrams
		2.2	Identify system/circuit components and inspect for

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	controls		compliance with specifications
		2.3	Undertake sequential installation according to manufacturers' specifications and SOPs
3	**Check and adjust fluid power system control sequence and operation**	3.1	Check controls and system operation against operational specifications using appropriate test equipment and application principles/techniques
		3.2	Perform adjustments to sequence system to meet/align to operational requirements and specifications
		3.3	Report modifications/alterations and according to SOPs
		3.4	Check controls and system operation and commission to specifications
4	**Fault find fluid power systems control circuit**	4.1	Interpret and apply system/circuit diagrams and data sheets
		4.2	Identify and inspect system/circuit components
		4.3	Trace system/circuit and diagnose action of components to identify and localise faults
		4.4	Test system/circuit parts using appropriate test equipment and application principles
		4.5	Assess system/circuit parts against operational specifications
		4.6	Localise fault condition at the component level
		4.7	Evaluate faulty condition, analyse root cause and plan corrective action
5	**Maintain, and repair or rectify system control**	5.1	Apply correct maintenance procedures
		5.2	Select and apply repair procedures using appropriate tools, equipment and techniques

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	components	5.3	Test faulty items, repair or replace using sequential installation procedures according to manufacturers' recommendations
		5.4	Select replacement items from appropriate sources
		5.5	Reassemble system control components according to specifications
6	**Check and adjust sequence of fluid power system controls**	6.1	Identify circuit sensors and controllers using circuit diagrams and fluid power system control principles
		6.2	Make necessary adjustments to sequence system control circuit to meet operational specification
		6.3	Check and verify correct operation of system control circuit against operational specification
		6.4	Commission fluid power system controls to specifications
		6.5	Adopt appropriate follow-up procedures
		6.6	Complete service/maintenance report

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fluid power systems control sequencing includes one (1) or more of the following:	• PLCs • relay logic control systems • unitised/modular sensors • transducers • timers • counters • associated equipment

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18022 Maintain fluid power controls (Release 1).

Release 1. Supersedes and is equivalent to MEM18022B Maintain fluid power controls.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18022 Maintain fluid power controls

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18022 Maintain fluid power controls (Release 1).

Release 1. Supersedes and is equivalent to MEM18022B Maintain fluid power controls.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting specifications system/circuit diagrams, system operation data sheets and control data and identifying and inspecting system components for compliance with specifications
- planning and undertaking sequential installation of fluid power systems and controls in accordance with manufacturers' specifications and procedures
- checking and adjusting control and system operation using appropriate test equipment ensuring that the sequence of operations conforms to specifications and operational requirements
- recording/reporting any modifications/alterations to the system in accordance with standard operating procedures
- fault-finding fluid power systems control circuit using fault-finding techniques and appropriate test equipment and identifying and localising components not conforming to operational specifications for repair/replacement
- repairing/replacing faulty items after testing for compliance to specifications using appropriate tools, equipment and techniques
- reassembling control components to meet specifications
- verifying correct operation of system power control circuit and commissioning the fluid power system controls to specifications
- initiating maintenance and/or service follow-up procedures and completing maintenance and/or service reports according to standard operating procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- system operational and control requirements and specifications

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- application of common fluid power system components and controllers
- system/circuit components
- special installation requirements
- fluid power and common test equipment and their application
- correct operational sequence of the system
- typical adjustments to correct sequencing variations from specification
- procedures for recording/reporting modifications/alterations and consequences of not recording/reporting
- fluid power system commissioning procedures
- component(s) not complying with operational specification and typical causes of component failure
- cause of the faulty condition in the component(s) and appropriate procedures for rectifying the faulty condition
- appropriate maintenance schedule and procedures
- appropriate control component repair procedures
- typical test equipment and applications
- circuit sensors and controllers
- common adjustments that can be made to control systems and their effect
- any maintenance/service follow-up procedures
- maintenance/service recording/reporting requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining fluid power controls at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18023 Modify fluid power system operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18023 Modify fluid power system operation (Release 1).

Release 1. Supersedes and is equivalent to MEM18023B Modify fluid power system operation.

Application

This unit of competency defines the skills and knowledge required to determine the requirements of the modification, undertake the modification and evaluate the modified or repaired fluid power system.

Tasks are undertaken based on analysis of service/maintenance reports and defective components, sub-assemblies and design faults are identified and appropriate redesign action is commissioned.

Preparation for redesign specifications and associated drawing changes/modifications are personally undertaken or delegated to appropriate personnel and supervised.

Where the modification requires the knowledge of programmable logic control (PLC) program installation or commissioning is required unit MEM10004 Enter and change programmable controller operational parameters and unit MEM10005 Commission programmable controller programs, should be selected as appropriate.

Where equipment condition monitoring and recording is required unit MEM18010 Perform equipment condition monitoring should also be selected.

Where analysing of plant and equipment condition monitoring results is required unit MEM18016 Analyse plant and equipment condition monitoring results should also be selected.

Where graphical techniques and simple statistical computations are required, unit MEM12025 Use graphical techniques and perform simple statistical computations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18018	Maintain pneumatic system components
MEM18019	Maintain pneumatic systems
MEM18020	Maintain hydraulic system components
MEM18021	Maintain hydraulic systems
MEM18022	Maintain fluid power controls
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine modification requirements**	2.1	Interpret and analyse service/maintenance reports and system output information
		2.2	Identify defective components, sub-assemblies and design faults using knowledge and principles of fluid power systems
		2.3	Verify defective components and design faults using appropriate means and techniques
		2.4	Develop corrective action plan in consultation with appropriate personnel
		2.5	Investigate modification/design options to overcome parts failure or design faults
		2.6	Develop and select most appropriate modifications design option and repair specifications
3	**Undertake modifications to fluid power systems**	3.1	Select replacement components from appropriate sources
		3.2	Undertake modifications or delegate to appropriate personnel and supervise
		3.3	Record modifications and document
4	**Monitor and evaluate repaired**	4.1	Monitor modified/repaired fluid power systems and assess operation system for compliance with operational

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
or modified fluid power system	specifications
	4.2 Evaluate modifications/repairs for effectiveness, efficiency and compliance with operational specifications
	4.3 Recommend further corrective action, where applicable, to appropriate personnel, instigate and monitor until desired efficiencies/outcomes are achieved
	4.4 Complete evaluation reports

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Analysis includes:	• interpretation and integration of data from process controls, instrumentation and condition monitoring systems and consultation with appropriate personnel

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18023 Modify fluid power system operation (Release 1).

Release 1. Supersedes and is equivalent to MEM18023B Modify fluid power system operation.

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Assessment Requirements for MEM18023 Modify fluid power system operation

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18023 Modify fluid power system operation (Release 1).

Release 1. Supersedes and is equivalent to MEM18023B Modify fluid power system operation.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining, interpreting and analysing service/maintenance and system output information
- identifying and verifying defective components, sub-assemblies and design faults using appropriate tools, equipment and techniques
- investigating modification requirements, including obtaining relevant information, to overcome parts failure or design faults in consultation with appropriate personnel
- undertaking modifications to fluid power systems and checking and evaluating the operation of the modified/repaired fluid power system for compliance with operational specifications
- recording/reporting modifications in accordance with SOPs
- initiating and monitoring further corrective action until desired efficiencies/outcomes are achieved
- completing evaluation reports on the modifications/repairs in accordance with standard operating procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- fluid power system performance, faults history and variations from operational specification
- faults attributable to poor design and defective components/sub-assemblies
- appropriate test equipment and applications and techniques for verifying design faults
- personnel to be consulted during the modification process
- specifications and sources of information pertaining to the selected modification/design option

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- modification/design options available to overcome system faults
- most appropriate modification/design option, including cost and benefits
- procedures for undertaking the selected modification/design option
- replacement components conforming to predetermined specifications from manufacturer's catalogues
- modifications to be undertaken
- revised operational specification of the fluid power system
- frequency of checks for compliance against operational specifications
- effectiveness and efficiency of the modifications/repairs and any variations from operational specifications
- any further modifications/repairs that could improve the effectiveness and efficiency of the fluid power system
- personnel to whom recommendations are to be made
- appropriate reporting requirements for recording/reporting modifications to fluid power systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying fluid power system operation at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply

Modification History

Release 1. Supersedes and is equivalent to MEM18045B Fault find/repair electrical equipment/components up to 250 volts single phase supply

Application

This unit of competency defines the skills and knowledge required to locate and rectify faults in equipment and components using up to 250 volts single phase power where they are disconnected from their electrical supply and this would also typically cover plug-in appliances.

It also covers basic mechanical disconnection, dismantling and reassembly of equipment components, enclosures and drives.

This unit should not be selected if unit MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c. has been selected.

Where disconnection and reconnection of fixed-wired equipment is required unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c. should also be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine equipment/component function by reference to circuit diagrams, schematics, manual and/or consultation with technical adviser
		2.2	Examine and interpret built-in fault indicators and error codes and record results to procedures, where appropriate
		2.3	Isolate equipment in accordance with procedures from power supply
		2.4	Check and test equipment/component using appropriate tools, test equipment, procedures and techniques

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.5	Interpret and verify check and test results, where required
	2.6	Identify, localise and record equipment/component fault in accordance with SOPs
3 **Rectify faults**	3.1	Repair, replace or adjust equipment/component/s and check and test to specification or manufacturers' requirements using appropriate tools, equipment and techniques
	3.2	Record rectifications report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• brushes • armatures • windings • relays • programmable controllers • other electronic switching devices
Appropriate fault-finding techniques	• testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include:

Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • multimeters • tong testers • wattmeters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18045B Fault find/repair electrical equipment/components up to 250 volts single phase supply

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply

Modification History

Release 1. Supersedes and is equivalent to MEM18045B Fault find/repair electrical equipment/components up to 250 volts single phase supply

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to fault find and repair electrical equipment/components up to 250 volts single phase supply
- checking that the electrical equipment/components are isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures
- locating and reading/recording built-in indicators and error codes
- checking and testing electrical components for correct operation and/or compliance with specifications
- identifying and localising faults in electrical equipment/components using appropriate fault-finding techniques and test equipment and recording/reporting faults in accordance with SOPs
- repairing/replacing or adjusting electrical equipment/components to specifications and selecting replacement parts using manufacturers' catalogues and data
- verifying that the electrical equipment/components are operating to specifications
- recording rectification activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operation and characteristics of active and passive components
- basic motor operation of various types
- function of the electrical equipment/component within the circuit
- relevant regulatory requirements
- electrical equipment/component isolation procedures

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- test equipment to be used to verify isolation of the electrical equipment/circuit
- errors indicated by built-in devices
- procedures for:
  - testing the operation of the electrical equipment/component and tools, equipment and techniques to be used and reasons for selection
  - localising faults in electrical equipment/components
  - recording/reporting faults in electrical equipment/components
  - recording electrical equipment/component rectifications
- specifications of the electrical equipment/component
- variations between test results and specifications
- techniques/procedures and adjustments that can be made for returning the electrical equipment/components to specification.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding/repairing electrical equipment/components up to 250 volts single phase supply at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or* its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18046B Fault find/repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

Application

This unit of competency defines the skills and knowledge required to diagnose, locate and rectify faults in electrical equipment/components up to 1000 volts a.c./1500 volts d.c. single and multi-phase power where these are disconnected from the electrical supply.

It covers basic mechanical disconnection, dismantling and reassembly of equipment components, enclosures and drives.

Where disconnection and reconnection of fixed-wired equipment is required unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c. should also be selected.

Where work involves up to 250 volt single phase supply only then unit MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply should be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **10**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine equipment/component function by reference to circuit diagrams, schematics, manual and/or consultation with technical adviser
		2.2	Examine and interpret built-in fault indicators and error codes and record results to procedures, where appropriate
		2.3	Isolate equipment in accordance with procedures from power supply
		2.4	Check and test equipment/component using appropriate tools, test equipment, procedures and techniques

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.5	Interpret and verify check and test results, where required
	2.6	Identify, localise and record equipment/component fault in accordance with SOPs
3 **Rectify fault(s)**	3.1	Repair, replace or adjust equipment/component/s and check and test to specification or manufacturers' requirements using appropriate tools, equipment and techniques
	3.2	Record rectifications report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• single and multi-phase motor drive and heating appliances • relays • coils • transformers • thermostats • gauges • illuminating devices • switches • circuit fuses and breakers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• brushes • armatures • windings • contactors • relays • programmable controllers • other electronic switching devices • switches • fuses • circuit breakers • relays • transformers • semi-conductor devices • regulators • motors
Appropriate fault-finding techniques include:	• testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity
Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • multimeters • tong testers • wattmeters • cathode ray oscilloscopes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18046B Fault find/repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

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Assessment Requirements for MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18046B Fault find/repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.
- checking that the electrical equipment/components are isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures
- locating and reading/recording built-in indicators and error codes
- checking and testing electrical equipment and components on non-interconnected circuits for correct operation and/or compliance with specifications
- identifying and localising faults in electrical equipment and components using appropriate fault finding techniques using appropriate fault finding techniques and test equipment and recording/reporting faults in accordance with SOPs
- repairing/replacing or adjusting electrical equipment/components to specifications and selecting replacement parts using manufacturers' catalogues and data
- verifying that the electrical equipment/components are operating to specifications
- recording rectification activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- function of the electrical equipment/component within the circuit
- relevant regulatory requirements
- electrical equipment/component isolation and tagging procedures
- test equipment to be used to verify isolation of the electrical equipment/circuit
- errors indicated by built-in devices

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- procedures for:
  - testing electrical equipment/components for correct operation
  - localising faults in electrical equipment/components
  - recording/reporting faults in electrical equipment/components
  - recording electrical equipment/component rectification
- tools, equipment and techniques to be used to test the operation of the electrical equipment/component and reasons for selection
- specifications of the electrical equipment/component
- variations between test results and specifications
- appropriate techniques/procedures for returning and confirming the electrical equipment/components have been returned to specification
- adjustments that can be made to electrical equipment/components.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding/repairing electrical equipment/components up to 1000 volts a.c./1500 volts d.c. at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18048 Fault find and repair/rectify basic electrical circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18048B Fault find and repair/rectify basic electrical circuits

Application

This unit of competency defines the skills and knowledge required to locate and repair/rectify faults in non-interconnected electrical circuits.

It applies to work on basic circuits which are defined as single circuits with single outputs. The single circuits may be controlled by one or more devices and the output may control one or more devices.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **12**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM10002	Terminate and connect electrical wiring
MEM10003	Install and test electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c.
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine circuit function and characteristics by reference to circuit diagrams, specifications, schematics and/or consultation with technical adviser
		2.2	Examine and interpret built-in fault indicators and error codes and record results to procedures, where appropriate
		2.3	Isolate circuit from power supply
		2.4	Verify and localise faults using appropriate tools, test equipment, procedures and techniques
		2.5	Record faults in accordance with SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Repair/rectify fault**	3.1 Repair/replace or adjust circuit/s to specifications or manufacturers' requirements
	3.2 Check and test circuit/s for compliance with site or manufacturers' specifications
	3.3 Record repair/rectification report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Specifications/regulations and drawings include one (1) or more of the following:	• legislative acts • wiring rules • other standards • specifications • electrical and architectural drawings
Appropriate fault-finding techniques include testing for the following:	• voltage • current • frequency • polarity • phase • circuit continuity • insulation resistance • earth continuity

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • multimeters • tong testers • wattmeters • cathode ray oscilloscopes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18048B Fault find and repair/rectify basic electrical circuits

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18048 Fault find and repair/rectify basic electrical circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18048B Fault find and repair/rectify basic electrical circuits

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- use appropriate personal protective equipment (PPE)
- identify and interpret specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to fault find and repair/rectify basic electrical circuits
- check and record built-in fault indicators and error codes to site requirements
- checking that the electrical circuit is isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures
- using diagnostic skills to locate faulty operation using appropriate fault-finding techniques and test equipment to verify faults
- test, adjust or set basic controls (e.g. pressure controls thermostats, timers and overloads)
- repairing/replacing or adjusting electrical circuits to specifications and verifying using appropriate test equipment that the electrical circuit is operating to manufacturers specifications
- recording rectification activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- circuit characteristics
- relevant regulatory requirements
- errors indicated by built-in devices
- circuit isolation and tagging procedures
- common electrical test instruments and their application
- common techniques for testing electrical circuits
- recording/reporting requirements for electrical circuit faults
- appropriate techniques/procedures for returning the circuit/s to specification

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- site/manufacturers' circuit specifications
- requirements for recording circuit rectifications or replacement.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing, repairing/rectifying basic electrical systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18049C Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Application

This unit of competency defines the skills and knowledge required to disconnect and reconnect equipment to all voltage levels up to1000 volts a.c./1500 volts d.c.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band:

This unit has dual status and is to be regarded as both a specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **3**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM12002	Perform electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Disconnect equipment**	2.1	Determine electrical characteristics of equipment and circuit by reference to circuit drawings, schematics, reference manuals, equipment specifications, identification plate and/or consultation with technical adviser
		2.2	Determine and record equipment characteristics, including direction of rotation, where appropriate
		2.3	Identify point/s of electrical isolation and isolate equipment in accordance with procedures
		2.4	Use all lock-off equipment and signage requirements appropriately
		2.5	Prove electrical isolation using appropriate techniques, procedures and test equipment
		2.6	Note, record and label conductor layout
		2.7	Disconnect conductors and terminate and make safe disconnected cables/connections
3	**Connect equipment**	3.1	Identify characteristics of the equipment to be connected and determine connection requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.2	Check circuit for safe isolation using appropriate test equipment, procedures and techniques
	3.3	Check connections and prepare conductors for termination
	3.4	Connect conductors to equipment in accordance with specifications and regulatory requirements
	3.5	Fasten/seal all cables/wires/conduit to specifications
	3.6	Remove all lock-off equipment and signage
	3.7	Check and test equipment and circuit for compliance with specifications and regulatory and legislative requirements
4 **Perform emergency first aid**	4.1	Assess situation to identify points of danger to the injured person and potential rescuer
	4.2	Undertake rescue/recovery of injured person or provide assistance to injured person in accordance with recognised standards/procedures
	4.3	Make contact with the appropriate medical and rescue authorities
	4.4	Record details of first aid given

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes:	• as defined in the licensing requirements, including electric motors, modular sensing switches and limit switches
Electrical isolation includes:	• safe disconnection of all electrical power to equipment or equipment supply circuits via switching, circuit breakers or fuses on circuits/equipment using up to 1000 volts a.c. or 1500 volts d.c. single or multi-phase supply
Test equipment and tools include one (1) or more of the following:	• voltmeters • multimeters • tong testers
Connect equipment includes:	• reconnection of existing equipment or the replacement on a 'like for like' basis with no alteration to existing fixed wiring and also includes the original connection of fixed wired equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18049C Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18049C Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.
- checking that the electrical equipment is isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures using appropriate lock-off equipment and tags/signs
- disconnecting equipment by labelling and recording conductors and making safe disconnected cables/connections using appropriate tools, test equipment, procedures and techniques
- confirming isolation prior to reconnecting fixed wired equipment and checking connections and preparing conductors for termination in accordance with manufacturers' specifications and regulatory requirements
- connecting conductors to equipment and fasten/seal cables/wires/conduits using appropriate procedures and tools to relevant specifications and regulatory requirements
- testing terminated cables to ensure continuity and insulation resistance and complying with following requirements:
  - checking continuity of the protective earth conductor to determine whether it is sufficiently low
  - testing the resistance between the protective earth conductor and the neutral conductor to determine whether it is sufficiently low – not greater than 2 Ohms
  - testing the insulation resistance of active conductors to confirm that it is greater than 1 Megohm
- removing all lock-off devices and signage and checking/testing equipment and circuits for compliance to specifications
- rescuing/recovering of injured person in accordance with appropriate standards/procedures and providing first aid, where appropriate, including contacting the appropriate medical and rescue authorities
- recording details of first aid given.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- basic knowledge of electrical theory for the operation of the circuit/equipment
- relevant regulatory requirements
- procedures for:
  - determining and recording equipment characteristics
  - proving and removing electrical isolation
  - labelling conductors and recording conductor layout
  - disconnecting conductors and terminating disconnected cables/connections
  - terminating conductors and checking connections and specifications that apply
  - connecting conductors to equipment
  - fastening and sealing the cables, wires and conduits and tools, techniques and equipment to be used
  - checking and testing the compliance of the equipment with specifications and tools, techniques and equipment to be used
  - recording first aid
- tools, techniques and equipment required to determine equipment characteristics, prove electrical isolation and disconnect/reconnect and terminate conductors
- point(s) of isolation for the fixed wired equipment and reasons for selecting the chosen isolation point(s)
- safe isolation and proving dead
- range of isolation procedures for the fixed wired equipment
- lock-off equipment and signs to be used and reasons for using and procedures for lock-off equipment and signage
- characteristics of the circuit and the equipment
- operational specifications of the fixed wired equipment
- points of danger to the injured person or potential rescuer
- recognised procedures for the movement and treatment of the injured person, including safe rescue of victim from a live situation, clearing of airways, care of spinal injuries, treatment of cuts/lesions, burns/scalds and treatment of shock
- appropriate local medical and rescue services.

Assessment Conditions

- Assessors must:
  - have vocational competency in disconnecting/reconnecting fixed wired equipment up to 1000 volts a.c./1500 volts d.c. at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18050 Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18050C Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.

Application

This unit of competency defines the skills and knowledge required to disconnect and reconnect and making safe for maintenance of equipment for all voltage levels above 1000 volts a.c./1500 volts d.c.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band:

This unit has dual status and is to be regarded as both a specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **3**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM12002	Perform electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Disconnect equipment**	2.1	Determine electrical characteristics of equipment and circuit by reference to circuit drawings, schematics, reference manuals, equipment specifications, identification plate and/or consultation with technical adviser
		2.2	Determine and record equipment characteristics, including direction of rotation, where appropriate
		2.3	Identify point/s of electrical isolation and isolate equipment in accordance with procedures
		2.4	Use all lock-off equipment and signage requirements appropriately
		2.5	Prove electrical isolation using appropriate techniques, procedures and test equipment
		2.6	Note, record and label conductor layout
		2.7	Disconnect conductors and terminate and make safe disconnected cables/connections
3	**Connect equipment**	3.1	Identify characteristics of the equipment to be connected and determine connection requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.2	Check circuit for safe isolation using appropriate test equipment, procedures and techniques
	3.3	Check connections and prepare conductors for termination
	3.4	Connect conductors to equipment in accordance with specifications and regulatory requirements
	3.5	Fasten/seal all cables/wires/conduit to specifications
	3.6	Remove all lock-off equipment and signage
	3.7	Check and test equipment and circuit for compliance with specifications and regulatory and legislative requirements
4 **Perform emergency first aid**	4.1	Assess situation to identify points of danger to the injured person and potential rescuer
	4.2	Undertake rescue/recovery of injured person or provide assistance to injured person in accordance with recognised standards/procedures
	4.3	Make contact with the appropriate medical and rescue authorities
	4.4	Record details of first aid given

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate techniques and procedures include:	• clearances for safe approach as mandated by statutory authorities
Electrical isolation includes:	• isolating supply for safe disconnection of all electrical power to equipment supply circuit with switch circuit breaker or fuses on circuits/equipment at voltage levels above 1000 volts a.c. and 1500 volts d.c.
Test equipment and tools include, in accordance with voltage and fault limiting requirements, one (1) or more of the following:	• appropriate proving dead meters • high potential testers • voltmeters
Signage includes one (1) or more of the following:	• tags • access permit holders • restricted access signs

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18050C Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18050 Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.

Modification History

Release 1. Supersedes and is equivalent to MEM18050C Disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to disconnect/reconnect fixed wired equipment over 1000 volts a.c./1500 volts d.c.
- checking that the electrical equipment is isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures using appropriate lock-off equipment and tags/signs
- disconnecting equipment by labelling and recording conductors and making safe disconnected cables/connections using appropriate tools, test equipment, procedures and techniques
- confirming isolation prior to reconnecting fixed wired equipment and checking connections and preparing conductors for termination in accordance with manufacturer's specifications and regulatory requirements
- connecting conductors to equipment and fasten/seal cables/wires/conduits using appropriate procedures and tools to relevant specifications and regulatory requirements
- inspecting and testing terminated cables to ensure they comply with continuity and insulation resistance requirements and are safely intended for use
- removing all lock-off devices and signage and checking/testing equipment and circuits for compliance to specifications
- rescuing/recovering of injured person in accordance with appropriate standards/procedures and providing first aid, including contacting the appropriate medical and rescue authorities
- recording details of first aid given.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- relevant regulatory requirements
- characteristics of the circuit and the equipment
- point(s) of isolation for the fixed wired equipment and reasons for selecting the particular isolation point(s) and reasons for using earthing, lock-off equipment and signs
- clearances from live parts
- safe isolation
- operational specifications of the fixed wired equipment and connections to be made
- procedures, techniques, tools and equipment to be used for:
  - determining and recording equipment characteristics
  - isolating the fixed wired equipment and proving electrical isolation
  - labelling conductors and recording conductor layout
  - disconnecting conductors
  - terminating disconnected cables/connections
  - checking circuits for safe isolation
  - terminating conductors and checking connections
  - connecting the conductors to the equipment
  - fastening and seal the cables, wires and conduits
  - removing lock-off equipment and signage
  - checking the operation of the equipment and circuits
  - checking and testing the compliance of the equipment with specifications
- potential dangers/risks associated with work
- recognised procedures for the movement and treatment of the injured person, including high voltage (HV) rescue, clearing of airways, care of spinal injuries, treatment of cuts/lesions, burns/scalds and treatment of shock
- appropriate local medical and rescue services
- procedures for incident reporting.

Assessment Conditions

- Assessors must:
  - have vocational competency in disconnecting/reconnecting fixed wired equipment over 1000 volts a.c./1500 volts d.c. at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18051 Fault find and repair/rectify complex electrical circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18051B Fault find and repair/rectify complex electrical circuits

Application

This unit of competency defines the skills and knowledge required to locate and repair/rectify faults in interconnected electrical circuits.

It applies to work on interconnected electrical circuits where electrical equipment and/or components are connected electrically, that is, there are multiple electrical power supplies or sources, voltages or circuits which are found in the control or switching of the circuit.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM10002	Terminate and connect electrical wiring
MEM10003	Install and test electrical wiring and circuits up to 1000 volts a.c. and 1500 volts d.c.
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18048	Fault find and repair/rectify basic electrical circuits
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine circuit/system function and characteristics by reference to circuit diagrams, specifications, schematics and/or consultation with technical adviser
		2.2	Examine and interpret built-in fault indicators and error codes and record results to procedures, where appropriate
		2.3	Isolate circuit power supply

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	2.4	Verify and localise faults using appropriate, tools and test equipment, procedures and techniques
	2.5	Record faults in accordance with SOPs
3 **Repair/rectify fault**	3.1	Repair/replace or adjust circuit/s to specifications or manufacturers' requirements
	3.2	Check and test circuit/s for compliance with site or manufacturers' specifications
	3.3	Record repair/rectification report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Specifications/regulations and drawings include one (1) or more of the following:	• legislative acts • wiring rules • other standards • specifications • electrical and architectural drawings
Appropriate fault-finding techniques include testing for the following:	• voltage • current • frequency • polarity

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- phase
- circuit continuity
- insulation resistance
- earth continuity

Test equipment includes one (1) or more of the following:

- continuity testers
- ammeters
- voltmeters
- multimeters
- tong testers
- wattmeters
- cathode ray oscilloscopes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18051B Fault find and repair/rectify complex electrical circuits

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18051 Fault find and repair/rectify complex electrical circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18051B Fault find and repair/rectify complex electrical circuits

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to fault find and repair/rectify complex electrical circuits
- checking that the electrical circuit/system is isolated and tagged where necessary in strict accordance with work health and safety (WHS) requirements and procedures
- locating and reading/recording built-in indicators and error codes
- using diagnostic skills to locate faulty operation using appropriate fault finding techniques and test equipment to verify faults
- repairing/replacing or adjusting electrical circuits/systems to specifications and verifying using appropriate test equipment that the electrical circuit/system is operating to specifications
- recording rectification activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- circuit characteristics
- relevant regulatory requirements
- errors indicated by built-in devices
- circuit isolation procedures
- common electrical test instruments and their application
- common techniques for testing electrical circuits
- recording/reporting requirements for electrical circuit faults
- appropriate techniques/procedures for returning the circuit/s to specification
- site/manufacturers' circuit specifications

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- requirements for recording circuit rectifications
- any applicable industry standards, national/Australian Standards, NOHSC guides, and state/territory regulatory codes of practice/standards.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing, repairing/rectifying complex electrical circuits/systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18053 Modify fluid power control systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18053 Modify fluid power control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18053B Modify fluid power control systems.

Application

This unit of competency defines the skills and knowledge required to check and test software programs, control system inputs and outputs, repair faulty system inputs and outputs, and prepare a service report.

It covers the skills required to alter the control parameters of fluid power control systems by system modification, this includes the ability to assess system performance based on sound working knowledge of established principles, methods and procedures.

System specifications are interpreted and understood from data sheets, circuit diagrams and flow diagrams.

Where equipment condition monitoring and recording only is required to be performed then unit MEM18010 Perform equipment condition monitoring and recording should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM12025	Use graphical techniques and perform simple statistical computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM16010	Write reports
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18018	Maintain pneumatic system components
MEM18019	Maintain pneumatic systems
MEM18020	Maintain hydraulic system components
MEM18021	Maintain hydraulic systems
MEM18022	Maintain fluid power controls
MEM18023	Modify fluid power system operation
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check/test control software program**	2.1	Check program steps against manufacturers' and site specifications using schematics, circuit and ladder diagrams and determine and record deviations
3	**Correct or modify control system software/program**	3.1	Correct and align program deviations to specification requirements
		3.2	Undertake modifications to program to specification requirements
		3.3	Back up and record modified program
4	**Check/test control system inputs/outputs**	4.1	Check and assess input/output signals against operational specifications using appropriate tools, equipment and techniques
		4.2	Identify and repair and record/report faulty signals to appropriate personnel
5	**Repair faulty control system input/output**	5.1	Repair and/or replace faulty signal source
		5.2	Test repaired/replaced signal source for correct operation in system and commission in compliance to operational specifications
6	**Prepare service report**	6.1	Prepare and complete a service report and include recommendations for improvement and repeat downtime avoidance analysis in accordance with SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control system includes one (1) or more of the following:	• programmable controllers (PCs) • distributed control system (DCS) • relay logic (electric-hydraulic-pneumatic)
Modifications to program includes one (1) or more of the following:	• software timers • gates • associated equipment • flow • ladder and logic diagrams
Fault-finding of system hardware input/outputs include one (1) or more of the following:	• input/output circuitry • cards • external sensors • limits • mnemonic coding and associated equipment

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18053 Modify fluid power control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18053B Modify fluid power control systems.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18053 Modify fluid power control systems

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18053 Modify fluid power control systems (Release 1).

Release 1. Supersedes and is equivalent to MEM18053B Modify fluid power control systems.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, data sheets, drawings, circuit and ladder diagrams and other applicable reference documents to modify fluid power control systems
- identifying, recording and correcting deviations of control software program from specification
- modifying control system software/program and recording and backing up the modified system program
- checking input and output signals for compliance to specifications using appropriate tools, equipment and techniques
- identifying, recording and correcting faulty signals and marking the source of the faulty signal for repair or replacement
- testing and commissioning repaired/replaced signal source in accordance with specifications and procedures
- recording/reporting service activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operational specifications and program steps and their function of the control system
- procedures for:
  - recording and correcting deviations of the control software program from specification
  - recording and backing up control system software modifications
  - recording/reporting faulty input/output signals
  - marking items for repair or replacement

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  - testing and commissioning signal sources into operation
  - reporting service undertaken on control systems
- modifications to be made to the control system software and reasons for modifying the control system software
- tools, equipment and techniques to be used to check input and output signals for conformance to specification
- tools, equipment and techniques necessary to repair the signal source
- disassembly/assembly procedures to be followed when repairing signal sources
- specifications of the signal source
- any trends and probable causes, evident in the data collected and collated and reasons for recommended improvements.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying fluid power control systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18054 Fault find, test and calibrate instrumentation systems and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18054B Fault find, test and calibrate instrumentation systems and equipment

Application

This unit of competency defines the skills and knowledge required to test instrumentation systems and equipment, apply data collection techniques and pinpoint fault conditions, analyse and report test results, and calibrate instrumentation systems and components.

Where soldering/desoldering of electrical/electronic components is required unit MEM05001 Perform manual soldering/desoldering – electrical/electronic components and unit MEM05002 Perform high reliability soldering and desoldering, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055 Dismantle, replace and assemble engineering components

Plus, one or more of the following, including their prerequisites:

MEM18057 Maintain/service analog/digital electronic equipment

MEM18064 Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Test instrumentation systems and equipment**	2.1	Identify and define work/test requirements
		2.2	Observe and pinpoint device isolation methods/requirements
		2.3	Apply appropriate test procedures and application principles in assessing operation of instrumentation systems, equipment and components
		2.4	Apply normal operating characteristics of instrumentation systems, equipment/components to the level necessary to identify and pinpoint faults
		2.5	Apply characteristics/operational function assessment procedures according to safety and regulatory/site specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.6	Check and verify characteristics and operational function
3	**Apply data collection techniques and pinpoint fault conditions**	3.1	Utilise drawings/diagrams and operational specifications in identifying and pinpointing fault conditions
		3.2	Examine and interpret built-in fault indicators and error codes and record results, where appropriate
		3.3	Pinpoint fault condition down to major component level using appropriate test equipment, procedures and techniques
4	**Analyse and report test results**	4.1	Analyse/verify test results against operational specifications and confirm faults
		4.2	Report potential and real faults in accordance with SOPs
		4.3	Evaluate faulty conditions and plan corrective action
		4.4	Record and document action plan in accordance with SOPs
5	**Install replacement parts**	5.1	Select replacement parts from catalogues
		5.2	Install replacement parts
		5.3	Check replacement parts for correct operation
6	**Calibrate instrumentation equipment/ components**	6.1	Undertake zero, span and range checks on indicators/controllers using appropriate configuration
		6.2	Perform and document methods of adjustment using calibration devices to prescribed procedures and operational specifications, where applicable

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Instrumentation systems include the following:	• those made up of more than one interdependent component controlling and processing multiple inputs and/or outputs
Tasks are undertaken include one (1) or more of the following:	• workshop/site • laboratory environments
Correct operational function determination includes the operational function of one (1) or more of the following:	• systems • equipment • components • associated equipment
Systems, components, equipment and associated items include one (1) or more of the following:	• electrical • electronic • mechanical • fluid power
Equipment includes one (1) or more of the following:	• process machines • temperature control systems • sterilisation units • water cooling/filtration systems • equipment utilising mechanical, pneumatic/electro-pneumatic or electronic (analog/digital) principles • associated instruments measuring variables including level, pressure light, flow, current, resistance, voltage, density and temperature

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• sensors • transmitters • converters • indicators • analysers • controllers • transducers • power supplies • removable circuit boards • sensor units associated with determining/controlling density, level, flow, temperature and composition of a range of materials
Test equipment includes one (1) or more of the following:	• system calibrators • manometers • dead weight testers • wheatstone bridge • potentiometers • frequency/signal generators • logic probes • multimeters (analog/digital) • test gauges • cathode ray oscilloscopes • other associated equipment

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18054B Fault find, test and calibrate instrumentation systems and equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18054 Fault find, test and calibrate instrumentation systems and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18054B Fault find, test and calibrate instrumentation systems and equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents and obtain relevant data with respect to the operation of the instrumentation systems/equipment
- locating, inspecting and testing a range of instrumentation system components
- isolating instrumentation system/equipment in accordance with procedures
- checking the individual components for correct operation using applicable test equipment
- reporting faults and developing a corrective action plan in accordance with SOPs
- recording and documenting the action plan in accordance with SOPs
- dismantling, repairing and reassembling faulty components by selecting replacement parts from manufacturer/supplier catalogues
- checking repaired/replaced instrumentation system components for correct operation and completing all service reports
- checking and verifying the operational functions of the instrumentation system/equipment including reading/recording and interpreting built-in fault indicators and error codes
- undertaking zero, span and range checks on instrumentation system/equipment in accordance with SOPs
- calibrating instrumentation system/equipment to prescribed procedures and operational specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- instrumentation principles controlling density, level, flow, temperature and composition of a range of materials
- effects of resistance, capacitance, inductance and impedance (R, L, C) upon an electrical circuit

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- interpretation requirements of schematic, wiring and block diagrams and circuits
- principles of hydraulic, pneumatic and electrical flow
- calibration procedures of instrumentation systems and equipment/components
- purpose/operational function of instrumentation system
- procedures for:
  - inspecting and testing instrumentation system and equipment to be used
  - repairing faulty instrumentation system
  - dismantling, reassembly and testing techniques
  - checking and verifying the operational function of the instrumentation system/equipment and operational specifications
  - recording and completing service reports and reporting faults
  - recording/documenting test and calibration results
- specifications of each instrumentation system and acceptable deviations from specifications
- correct operation of the instrumentation system, including the procedures for isolating instrumentation systems
- range of faults in instrumentation system/equipment components
- variations between test results and operational specifications
- probable causes of faults in instrumentation system/equipment components and action to be taken to rectify the causes of faults
- sequence of events to be undertaken to correct faults in the instrumentation system/equipment components
- errors indicated by built-in devices
- methods of determining procedures
- difference between real and potential faults
- function and procedures for zero, span and range checks on instrumentation systems/equipment
- equipment required to carry out the calibration of instrumentation systems/equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding, testing and calibrating instrumentation systems and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18055 Dismantle, replace and assemble engineering components

Modification History

Release 1. Supersedes and is equivalent to MEM18055B Dismantle, replace and assemble engineering components

Application

This unit of competency defines the skills and knowledge required to dismantle, identify faulty components, select replacements and assemble engineering components into assemblies or sub-assemblies in accordance with standard operating procedures (SOPs).

It also applies to the straightforward removal and replacement of pre-manufactured bearings and seals.

Where precision mechanical measurement is required unit MEM12003 Perform precision mechanical measurement should also be selected.

Where fitting techniques and principles are required to assess component condition, and/or modify components to achieve precision fits unit MEM18006 Perform precision fitting of engineering components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Dismantle engineering components**	2.1	Inspect engineering components and analyse task requirements
		2.2	Dismantle components using appropriate tools and techniques
		2.3	Mark components for identification, where required
3	**Identify faulty components and select replacement parts**	3.1	Obtain and interpret specifications for components from appropriate source
		3.2	Identify out-of-specification, damaged or faulty components
		3.3	Identify faulty components for repair, replacement or adjustment

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Select replacement and/or repaired parts for reassembly
4 **Assemble engineering components into assemblies or sub-assemblies**	4.1 Prepare, assemble and adjust components using fastening equipment and methods using appropriate tools, equipment and techniques which ensures compliance to specifications
	4.2 Select and apply lubrication, packing and sealing materials
	4.3 Inspect, test and adjust final component assembly, as necessary, for compliance with operational specifications and return to use according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engineering components include one (1) or more of the following:	• couplings • universal joints • pumps employing shafts • pre-manufactured bearings and seals • lubricants • fasteners • gaskets

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate tools and equipment include one (1) or more of the following:	• a range of hand and power tools • bearing pullers • special purpose dismantling and assembly tools

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18055B Dismantle, replace and assemble engineering components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18055 Dismantle, replace and assemble engineering components

Modification History

Release 1. Supersedes and is equivalent to MEM18055B Dismantle, replace and assemble engineering components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to dismantle, replace and assemble engineering components
- dismantling components using appropriate techniques, tools and equipment and marking component parts for reassembly purposes
- checking component parts visually and dimensionally for compliance to specification and marking faulty parts for repair, replacement or adjustment
- selecting replacement parts using manufacturers' catalogues and data
- assembling components using appropriate techniques and principles
- inspecting final assembly for compliance to specifications
- returning the final assembly to service in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tasks to be performed in accordance with SOPs
- tools and equipment associated with dismantling the components
- procedures for:
  - checking components for conformance to specification and equipment required
  - assembling components and requirements of the assembly in terms of specifications, operational performance, quality and safety
  - lubricating the assembly
  - returning components/assemblies into use and checks to be undertaken during inspection of the final assembly
- specifications of the components to be replaced, including features and/or dimensions
- process of identifying replacement parts from catalogues

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- packing and sealing materials.

Assessment Conditions

- Assessors must:
  - have vocational competency in dismantling, replacing and assembling engineering components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18056 Diagnose and repair analog equipment and components

Modification History

Release 1. Supersedes and is equivalent to MEM18056B Diagnose and repair analog equipment and components

Application

This unit of competency defines the skills and knowledge required to locate faults in analog electronic equipment or sub-assemblies, and replace faulty components.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/de-soldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where termination of cables is required unit MEM10002 Terminate and connect electrical wiring and unit MEM18063 Terminate signal and data cables, should also be selected as appropriate.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **10**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic

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	components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18057	Maintain/service analog/digital electronic equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault in electronic system/sub-assembly**	2.1	Determine functions and principles of system/sub-assembly with reference to equipment manuals and circuit diagrams
		2.2	Run built-in test functions and fault indicator error codes and check and review appropriate maintenance records
		2.3	Reproduce fault symptoms and verify using appropriate

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		fault-finding techniques
	2.4	Isolate and remove faulty sub-assembly from electronic system using appropriate tools and techniques, where appropriate
	2.5	Check and test sub-assembly using appropriate test equipment and fault-finding techniques
	2.6	Identify faulty component and/or isolate fault cause
3 **Repair/replace faulty components**	3.1	Remove faulty component using appropriate tools and techniques
	3.2	Repair/replace faulty component in accordance with site/manufacturers' recommended procedure
	3.3	Re-fit repaired/replacement components into system/sub-assembly
	3.4	Refit repaired sub-assembly to electronic system, where appropriate
	3.5	Check and test systems/sub-assembly for compliance with specifications utilising appropriate test procedures and equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electronic systems and equipment include one (1) or more of the following:

- amplifiers
- analog hardware
- communication
- consumer audio/video
- electronic appliances
- scanning systems
- security/fire systems
- power supplies
- test equipment

Fault-finding techniques include one (1) or more of the following:

- signal injection
- substitution
- monitoring
- measurement
- heating
- sound
- visual
- touch
- smell

Test equipment includes one (1) or more of the following:

- continuity testers
- ammeters
- voltmeters
- cathode ray oscilloscopes
- frequency counters
- signal generators
- digital probes

Components include (1) one or more of the following:

- discrete component assemblies
- individual components, including:
  - resistors
  - switching devices
  - capacitors
  - transformers
  - solenoids
  - tubes
  - semi-conductors

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18056B Diagnose and repair analog equipment and components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18056 Diagnose and repair analog equipment and components

Modification History

Release 1. Supersedes and is equivalent to MEM18056B Diagnose and repair analog equipment and components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuit diagrams, specifications, schematics, maintenance records, drawings, supplier catalogues and obtain relevant data with respect to diagnosing and repairing analog equipment and components
- checking electronic equipment/sub-assemblies, components, connections and terminations for compliance to specifications
- locating, reading/recording and diagnosing built-in fault indicators and obtaining error code interpretation documents and running test functions and recording faults and/or equipment status indicated by built-in test functions/displays
- checking and testing sub-assembly using appropriate test equipment for compliance with specifications
- reproducing fault symptoms in the electronic equipment and verifying faults using appropriate test equipment and fault-finding techniques to locate and isolate faulty component or fault cause
- removing and replacing faulty components from the electronic equipment
- adjusting/tuning, calibrating and testing the repaired electronic equipment/sub-assemblies to specifications
- returning the repaired electronic equipment/sub-assembly to service in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- implications of electro-static discharge (ESD) upon the electronic equipment
- analog electronics, including amplifiers, oscillators, power suppliers and filters
- function(s) of the electronic equipment/sub-assembly
- symptoms of the fault in the electronic equipment/sub-assembly

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- purpose of reproducing electronic equipment/sub-assembly fault symptoms
- equipment and techniques to be used to test the faulty sub-assemblies/component
- probable causes of component failure
- procedures for:
  - running built-in test functions
  - verifying faults in electronic equipment/sub-assemblies
  - isolating electronic equipment/sub-assemblies
  - removing sub-assemblies from electronic equipment
  - testing faulty sub-assemblies and removing faulty components from electronic equipment
  - fitting repaired/replaced components into sub-assemblies and fitting repaired sub-assemblies into electronic equipment
  - testing electronic equipment/sub-assembly performance
- errors indicated by built-in devices
- test equipment and fault-finding techniques necessary to confirm electronic equipment/sub-assembly faults
- tools and techniques to be used to remove/refit/repair/replace the faulty sub-assemblies/component from the electronic equipment
- operational specifications of the sub-assembly and electronic equipment/component
- test equipment and techniques necessary to check electronic equipment/sub-assembly performance.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and repairing analog equipment and components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

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MEM18057 Maintain/service analog/digital electronic equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18057B Maintain/service analog/digital electronic equipment

Application

This unit of competency defines the skills and knowledge required to maintain/service analog/digital electronic equipment.

Where termination of cables is required see unit MEM10002 Terminate and connect electrical wiring and unit MEM18063 Terminate signal and data cables, as appropriate.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where diagnosis and repair of electronic equipment is undertaken to component level unit MEM18056 Diagnose and repair analog equipment and components and unit MEM18065 Diagnose and repair digital equipment and components, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12004	Perform precision electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake maintenance checks and routine tests**	2.1	Determine the function of electronic equipment by reference to circuit diagrams, equipment manuals and/or consultation with equipment operator, where appropriate
		2.2	Run equipment built-in test functions and record results, where appropriate
		2.3	Note and record built-in faults/status display
		2.4	Check equipment/sub-assemblies, components, connections and terminations visually using appropriate test equipment and techniques
		2.5	Remove and replace faulty components, where appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.6	Check all results for compliance with manufacturers' requirements or specification and record results to SOPs
3	**Maintain and/or service electronic equipment**	3.1	Isolate sub-assemblies in accordance with procedures, where appropriate
		3.2	Adjust electronic equipment/sub-assemblies to specifications, manufacturers' requirements and/or procedures using appropriate tools, test equipment and techniques
4	**Return electronic equipment to service**	4.1	Return equipment/sub-assemblies into service
		4.2	Check equipment/sub-assemblies for operational compliance to specifications and/or manufacturers' requirements
		4.3	Complete all documentation requirements according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electronic systems and equipment include one (1) or more of the	• amplifiers • analog/digital hardware • telecommunication

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:	• consumer audio/video • electronic appliances • process control • computer systems • security monitoring and alarm systems • scanning systems • fire systems • power supplies • test equipment
Components include one (1) or more of the following:	• discrete component • circuit boards • connectors • plug-in items • power supplies
Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • cathode ray oscilloscopes • frequency counters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18057B Maintain/service analog/digital electronic equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18057 Maintain/service analog/digital electronic equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18057B Maintain/service analog/digital electronic equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuit diagrams, specifications, schematics, maintenance records, drawings, supplier catalogues and obtain relevant data with respect to maintaining/servicing analog/digital electronic equipment
- locating, reading/recording and diagnosing built-in fault indicators and obtaining error code interpretation documents and running test functions and recording faults and/or equipment status indicated by built-in functions/display
- checking electronic equipment/sub-assemblies and components using appropriate test equipment for compliance with specifications
- removing and replacing components from the electronic equipment
- maintaining and/or servicing electronic equipment by isolating sub-assembly from power supply and adjusting/tuning and calibrating in accordance with specifications and verifying for operational compliance
- returning the repaired/serviced electronic equipment to service
- recording all test results in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- function(s) and operational specifications of the electronic equipment/sub-assembly and electrical principles associated with electronic sub-assemblies
- implications of electro-static discharge (ESD) upon the electronic equipment
- procedures for:
  - running built-in test functions
  - recording faults and/or equipment status identified by built-in test functions/displays
  - checking electronic equipment/sub-assemblies, components, connections and terminations for compliance with specifications

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    - removing/refitting faulty components from electronic equipment
    - testing electronic equipment
    - recording electronic equipment test results
    - isolating electronic equipment/sub-assemblies
    - recording/documenting the maintenance servicing of the electronic equipment/sub-assembly
    - adjusting/tuning and calibrating and return the electronic equipment/sub-assembly back into service and tools, equipment and techniques to be used
    - checking the electronic equipment/sub-assembly for conformance to specification and equipment and techniques to be used
- errors indicated by built-in devices
- tools and techniques to be used to remove/replace components from/into electronic equipment
- equipment and techniques to be used to test the electronic equipment.

Assessment Conditions

- Assessors must:
    - have vocational competency in maintaining/servicing analog/digital electronic equipment at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18058 Modify electronic equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18058C Modify electronic equipment

Application

This unit of competency defines the skills and knowledge required to modify and recommission electronic equipment.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/de-soldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where drafting skills are required unit MEM09003 Prepare basic engineering drawing and unit MEM09004 Perform electrical or electronic detail drafting, should also be selected as appropriate.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18056	Diagnose and repair analog equipment and components
MEM18057	Maintain/service analog/digital electronic equipment
MEM18065	Diagnose and repair digital equipment and components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Modify equipment**	2.1	Determine modification requirements by reference to circuit diagrams, schematics, equipment manuals and/or consultation with technical authority, where appropriate
		2.2	Isolate equipment in accordance with procedures
		2.3	Remove equipment from system using appropriate techniques and equipment, if required
		2.4	Carry out modification to equipment/sub-assembly/component in accordance with specifications or application requirements using

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	appropriate techniques and equipment
	2.5 Refit sub-assembly to equipment
3 **Return equipment to service**	3.1 Amend circuit diagrams, schematics and equipment manuals to reflect modifications undertaken
	3.2 Undertake checks and tests to specifications using appropriate tools, test equipment and techniques
	3.3 Recommission equipment/system using appropriate techniques and procedures
	3.4 Check equipment/system for operational compliance with specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Modifications of analog and digital electronic equipment and systems include one (1) or more of the following:	• minor adjustments and alterations
	• experimental and developmental modifications of a complex nature
	• replacement and/or alterations of:
	  • system equipment
	  • sub-assemblies
	  • printed circuit board (PCB) components

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • cathode ray oscilloscopes • frequency counters • signal generators • digital probes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18058C Modify electronic equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18058 Modify electronic equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18058C Modify electronic equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (sops) and safe work practices
- identifying and interpreting circuit diagrams, specifications, schematics, maintenance records, drawings, supplier catalogues and obtaining relevant data with respect to modifying electronic equipment
- isolating and tagging electronic equipment in strict accordance with work health and safety (WHS) requirements and procedures using appropriate lock-off equipment and tags/signs
- checking that the electronic equipment is isolated and tagged where necessary
- removing sub-assembly/equipment from the system and carrying out applicable modifications
- refitting modified sub-assembly/equipment to system and checking/testing for compliance to specifications utilising appropriate test equipment
- recommissioning electronic equipment using appropriate techniques and procedures
- amending circuit diagrams, schematics, equipment manuals, specifications affected by the modifications
- recording all modifications according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- implications of electro-static discharge (ESD) upon the electronic equipment
- system concept, including software/hardware systems, feasibility analysis and circuit analysis
- diagnostic skills and implications relative to the modification
- modification and specification requirements and sources of technical advice applicable to the modification
- procedures for isolating and removing equipment from the system
- permits/approvals required

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- tools and equipment and specialised fitting requirements necessary to carry out the modification
- operational specifications, procedures of electronic equipment and the applicable test equipment
- procedures for recommissioning electronic equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying electronic equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18059 Modify electronic systems

Modification History

Release 1. Supersedes and is equivalent to MEM18059B Modify electronic systems

Application

This unit of competency defines the skills and knowledge required to undertake modifications to electronic systems and includes testing and evaluating the modified system.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/de-soldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where drafting skills are required unit MEM09003 Prepare basic engineering drawing and unit MEM09004 Perform electrical or electronic detail drafting should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18056	Diagnose and repair analog equipment and components
MEM18057	Maintain/service analog/digital electronic equipment
MEM18058	Modify electronic equipment
MEM18065	Diagnose and repair digital equipment and components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine modification**	2.1	Determine modification requirements by reference to schematics, circuit diagrams, documentation and/or consultation with appropriate authority
		2.2	Analyse maintenance reports and system output information to confirm the need and nature of modification, where appropriate
		2.3	Determine scope and nature of modifications, confirm with appropriate authority and record according to SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Undertake modification/s**	3.1	Undertake modification/s using appropriate tools, procedures and techniques
		3.2	Amend circuit diagrams, schematics and equipment manuals to reflect modifications undertaken
		3.3	Update computer software, if required
4	**Test and evaluate modified electronic systems**	4.1	Check/test modifications and evaluate for compliance with desired outcome or specification using appropriate tools, test equipment and techniques
		4.2	Recommend additional modification changes in accordance with SOPs, if required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Modifications include the following:	• approved design changes and/or replacement of components or sub-assemblies on electronic analog and digital systems • updating proprietary software, where appropriate
Systems include one (1) or more of the following:	• computer • process • communication • digital

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- security/fire

Test equipment includes one (1) or more of the following:

- continuity testers
- ammeters
- voltmeters
- cathode ray oscilloscopes
- frequency counters
- signal generators
- digital probes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18059B Modify electronic systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18059 Modify electronic systems

Modification History

Release 1. Supersedes and is equivalent to MEM18059B Modify electronic systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuit diagrams, specifications, schematics, maintenance records, drawings, supplier catalogues and obtaining relevant data, including relevant maintenance reports and system output information with respect to modifying electronic systems
- obtaining approval for modifications to electronic systems from appropriate authorities and recording the proposed modifications in accordance with SOPs
- carrying out modifications on electronic analog or digital systems
- checking modified electronic system for compliance to specifications utilising appropriate test equipment
- programming computers, including uploading/downloading of proprietary software, where appropriate
- testing and evaluating modified electronic system for compliance to specifications
- amending circuit diagrams, schematics, equipment manuals, specifications affected by the modifications
- recording all modifications in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- implications of electro-static discharge (ESD) upon the electronic equipment
- advanced analog and digital electronics theory
- modifications to be made to the electronic system and reasons for undertaking the modification
- appropriate personnel to consult for technical advice
- probable causes for any detected trends and/or deviations from specification
- appropriate authority to authorise modifications to electronic systems and changes to documentation, circuit drawings and schematics

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- procedures to be followed when undertaking and recording modifications to electronic systems
- tools and techniques to be used to modify the electronic system
- procedures for amending documents, circuit drawings and schematics
- procedures for checking the performance of the modified electronic system
- test equipment, techniques and operational specifications to be used to evaluate the modified electronic system
- deviations/variations of test results from operational specifications and probable causes of any deviations/variations from specification
- likely effect of further modifications on electronic system performance.

Assessment Conditions

- Assessors must:
  - have vocational competency in modifying electronic systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18060 Maintain, repair control instrumentation - single and multiple loop control systems

Modification History

Release 1. Supersedes and is equivalent to MEM18060B Maintain, repair control instrumentation – single and multiple loop control systems

Application

This unit of competency defines the skills and knowledge required to determine control loop characteristics, monitor and record the operation of a control loop, localise the fault condition, and replace or repair the faulty condition.

It applies to split architecture single/multiple loop control instrumentation that includes programmable logic controllers (PLCs), distributed control systems (DCS) and computer-based systems.

Where fault-finding is required to electronic component level unit MEM18056 Diagnose and repair analog equipment and components and unit MEM18065 Diagnose and repair digital equipment and components, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement
MEM12023	Perform engineering measurements

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18054	Fault find, test and calibrate instrumentation systems and equipment
MEM18055	Dismantle, replace and assemble engineering components
MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Plus, one or more of the following, including their prerequisites:

MEM18057	Maintain/service analog/digital electronic equipment
MEM18064	Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine control loop**	2.1	Examine engineering specifications, technical information and historical trends for relevant data

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	operating characteristics	2.2	Examine, read and interpret system specifications, operational data and other relevant data sources and note relevant conclusions
		2.3	Consult with system operators and other relevant plant personnel and extract relevant data and document by appropriate means
		2.4	Observe operation of the system by applying all control loop device characteristics, controller mode principles and adjustment methods
3	**Monitor and record operation of a control loop**	3.1	Interpret pneumatic, electrical and electronic circuit diagrams
		3.2	Set point and manual output changes by applying all control loop device characteristics, controller mode principles and calibration/adjustment methods, and loop operation from the controller response using appropriate test equipment, principles and procedures
		3.3	Interpret software configuration data for digital control systems
		3.4	Monitor and record operational responses
		3.5	Utilise fault-finding and diagnostic techniques throughout the checking and testing procedures including simple and multi-controller type control schemes
		3.6	Analyse diagnostic results and conclusions against predetermined operational specifications
4	**Localise fault condition**	4.1	Test circuits to the level necessary to identify and localise faults using fault-finding, diagnostic techniques and appropriate test equipment
		4.2	Utilise drawings/diagrams and operational testing data in identifying and localising fault conditions
		4.3	Verify and localise fault condition to major component level using appropriate test equipment, procedures and

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			techniques
5	**Replace faulty items or repair faulty condition**	5.1	Dismantle components for repair or replacement using appropriate tools, equipment and techniques
		5.2	Select replaceable items from manufacturers' catalogues, spare parts lists or data sheets
		5.3	Repair faulty condition, where applicable
		5.4	Reassemble repaired and replaceable items
6	**Calibrate and adjust control instrumentation**	6.1	Calibrate and adjust panel mounted, split architecture single loop/multiple loop control instruments using appropriate calibration principles, equipment and methods for all devices according to manufacturers' instructions
		6.2	Adjust controller modes and actions are adjusted according to specifications
		6.3	Undertake zero span and range checks using appropriate configuration
		6.4	Make final adjustments to control instrumentation to meet specifications
7	**Complete service reports and recommission**	7.1	Complete service reports in accordance with SOPs
		7.2	Adopt appropriate follow-up procedures
		7.3	Recommission control instrumentation in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Historical trends include one (1) or more of the following:	• supervisory control and data acquisition (SCADA) • charts • chart recorders and data loggers • equipment conditioning monitoring
An open and closed loop system includes:	• final control elements • process measuring devices • converters • controllers • process signals
Relevant data includes one (1) or more of the following:	• maintenance records • fault indicators • charts • error codes • operational symptoms • observation monitoring • consultation with appropriate personnel
Major components include one (1) or more of the following:	• transducers • power supplies • removable circuit boards • sensor units • other like components

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18060B Maintain, repair control instrumentation – single and multiple loop control systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18060 Maintain, repair control instrumentation - single and multiple loop control systems

Modification History

Release 1. Supersedes and is equivalent to MEM18060B Maintain, repair control instrumentation – single and multiple loop control systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuit diagrams, specifications, software data, diagrams and drawings, historical trends and documents and obtaining relevant data pertaining to the system components and operational data
- consulting with system operators and other relevant personnel with respect to the control loop and confirming function/ malfunction of the system and/or its components
- checking operational characteristics of the control devices, signal conversion instruments and final control elements for compliance to specifications
- locating, reading and interpreting in-built fault indicators and error codes and identifying faults/defects in control system
- obtaining relevant pneumatic, electrical and electronic circuit diagrams and testing and monitoring control loop for correct operation and recording the responses of the control system
- using fault-finding and diagnostic techniques and procedures throughout the monitoring and testing phase and comparing collected data with the operational specifications of the control system
- dismantling, repairing and reassembling faulty components, including selecting replacement parts from manufacturer/supplier catalogues
- calculating the control loop characteristics for the appropriate system in accordance with specifications
- setting and adjusting the controller modes using appropriate test and calibration equipment
- checking the control instrumentation for correct zero, span and range and making final adjustments, as required and recommissioning the control system
- completing all service reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- mathematical computations, including algebra, exponentials and logarithms, equations, graphs, charts, vectors, complex numbers and Boolean algebra
- relevant data, including information from in-built devices, on the control loop characteristics
- specifications of each system component
- control programming
- supervisory control and data acquisition (SCADA) systems, programmable logic controller (PLC) systems, distributive control systems (DCS) and computer-based systems
- procedures for:
  - documenting/reporting information and control system tests and analysis
  - isolating and testing the control system and its components
  - verifying apparent faults in circuits and/or control system components
  - marking components for repair or replacement
  - dismantling/disassembling components for repair or replacement
  - assembling repaired and/or replacement items
  - calibration of control system components and necessary equipment
  - checking control instruments for zero, span and range
  - making final adjustments to ensure all control system components conform to specification
  - commissioning the control system
- signal transmission, including the principles of operation of the final control element, procedures for calibrating and adjusting the control system
- correct function of the circuits and components within the control loop
- calibration and adjustment methods for the control loop devices
- configuration of the digital control system software
- operational responses and procedures for monitoring and recording test and operational data
- fault-finding and diagnostic techniques throughout the monitoring and testing process
- deviations/variations from specification
- correct maintenance procedures for serviceable item(s)
- adjustments which affect the calibration to control system components
- controller modes and actions
- reporting/recording requirements associated with the commissioning of the control system
- follow-up actions to be undertaken after maintaining/repairing control system instrumentation.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, repairing control instrumentation – single and multiple loop control systems at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18061 Maintain/calibrate complex control systems

Modification History

Release 1. Supersedes and is equivalent to MEM18061B Maintain/calibrate complex control systems

Application

This unit of competency defines the skills and knowledge required to determine system specification and control loop characteristics, and test, monitor and record system operation.

It applies to localising the fault condition; repairing or replacing faulty condition; calibrating, configuring and adjusting complex control systems; and recommissioning the system.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/desoldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

Path 1	MEM05001	Perform manual soldering/desoldering - electrical/electronic components
	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12004	Perform precision electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering

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	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18057	Maintain/service analog/digital electronic equipment
	MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
	MEM18069	Maintain, repair instrumentation process control analysers
Path 2	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18064	Maintain instrumentation system components
	MEM18069	Maintain, repair instrumentation process

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		control analysers
Path 3	MEM05001	Perform manual soldering/desoldering - electrical/electronic components
	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12004	Perform precision electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18057	Maintain/service analog/digital electronic equipment
	MEM18060	Maintain, repair control instrumentation - single and multiple loop control systems
	MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
	MEM18067	Tune control loops - multi controller or multi element systems
Path 4	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling

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MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18054	Fault find, test and calibrate instrumentation systems and equipment
MEM18055	Dismantle, replace and assemble engineering components
MEM18060	Maintain, repair control instrumentation - single and multiple loop control systems
MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
MEM18064	Maintain instrumentation system components
MEM18067	Tune control loops - multi controller or multi element systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine system specifications and control loop characteristics**	2.1	Examine engineering specifications, technical information and historical records and trends and document relevant data
		2.2	Obtain, read and interpret system specifications and operational data, including those for multiple loop control systems and devices
		2.3	Obtain, read and interpret circuit and logic diagrams and configuration data
		2.4	Consult with system operators and other relevant plant personnel and extract and document relevant data by appropriate means
		2.5	Obtain appropriate work clearances for monitoring and testing the system
3	**Test, monitor and record system operation**	3.1	Collect all relevant data by appropriate means from all sources
		3.2	Analyse fault detection and diagnostic data against predetermined operational specifications, and document conclusions
		3.3	Observe system operation by applying all individual/multiple element loop device characteristics, controller mode principles, testing, calibration and adjustment methods
		3.4	Set up and undertake tests using appropriate test equipment in accordance with procedures
		3.5	Set up and use signal transmission test equipment, where applicable
		3.6	Determine adjustment/maintenance needs through interpretation and analysis of pneumatic, electrical,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			electronic, logic diagrams and configuration data for all control system devices
		3.7	Connect and test field instrumentation for selected control operation, and monitor performance against specifications
		3.8	Carry out diagnostics checks to ensure correct operation
		3.9	Undertake fault finding and diagnostic tests on faulty control system components or elements using appropriate equipment, procedures and techniques
		3.10	Analyse and evaluate fault condition and plan corrective action
4	**Replace faulty items or repair faulty condition**	4.1	Dismantle faulty items for repair or replacement using appropriate tools, equipment and techniques according to manufacturers' recommendations
		4.2	Select replaceable items from manufacturers' catalogues, spare parts lists or data sheets
		4.3	Establish correct maintenance procedures for faulty items using manufacturers' handbooks
		4.4	Repair faulty items and/or faulty condition, where applicable
		4.5	Reassemble repaired and replaceable items to meet specifications
5	**Calibrate, configure, adjust complex control systems**	5.1	Carry out diagnostic checks to ensure correct operation of system and take appropriate corrective action, as necessary
		5.2	Select/set up calibration and test equipment to enable calibration to manufacturers' specifications
		5.3	Undertake mechanical alignment of control devices, where applicable
		5.4	Configure system using appropriate programming tools

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		and techniques
		5.5 Perform all relevant alignment procedures for optimum control and in accordance with specifications
		5.6 Set up recording equipment for adjustment and monitoring during alignment
		5.7 Perform calibration and adjustment function on multi-loop devices, multi-element control loops, controller modes and actions according to operational specifications using appropriate techniques applicable to the type of control loop being serviced
		5.8 Make online changes to parameters in the system to meet specified requirements
		5.9 Connect field instrumentation for selected control operation and system and ensure it is operated to a satisfactory level of control
6	**Return system to service**	6.1 Undertake final adjustments to align system operation to operational specifications, including process and optimum control efficiencies
		6.2 Return system to service
		6.3 Complete service reports in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control loop includes:

- a process of documenting and recording measurements and variables within the process

Relevant data includes one (1) or more of the following:

- maintenance records
- fault indicators
- chart recorders
- data loggers
- error codes
- operational symptoms
- observation monitoring
- tests

Test equipment includes one (1) or more of the following:

- engineering level
- laser alignments
- appropriate equipment for the measurement of:
  - alignment
  - flatness
  - squareness
  - straightness
  - temperature
  - vibration
  - load deflection
  - noise level
  - RPM

Control system includes one (1) or more of the following:

- pneumatic control
- analog and/or digital electronics
- distributed programmable logic controller (PLC)
- distributive control systems (DCS)
- supervisory control date acquisition (SCADA)
- computer-based control systems which include supervisory mode

Field instrumentation includes:

- test and measuring equipment which includes specialised testing fixtures or equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control strategies include one (1) or more of the following:	• ratio • cascade • selector • duplex • feed forward • adaptive • dynamic compensations • computations • energy management • environmental control/systems
Return system to service includes one (1) or more of the following:	• configuring • calibrating • adjusting • tuning • final validation of system performance

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18061B Maintain/calibrate complex control systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18061 Maintain/calibrate complex control systems

Modification History

Release 1. Supersedes and is equivalent to MEM18061B Maintain/calibrate complex control systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting manuals, specifications, software data, historical trends and diagrams, including pneumatic, electrical, electronic and logic diagrams, as well as program listings and configuration data for control system devices pertaining to the system components and operational data
- consulting with system operators and other relevant personnel with respect to the control loop characteristics and confirming function/malfunction of the system and/or its components and documenting information obtained
- obtaining the necessary work clearances for monitoring and testing of the system
- locating, reading and interpreting in-built fault indicators and error codes and identifying faults/defects in control system and comparing and analysing collated data with the operational specifications of the control system
- observing the operation of control system, confirming function/malfunction of the system and/or its components
- setting up and using test equipment to measure and analyse to ensure correct operation
- connecting field test instruments and monitoring and performing diagnostic checks on selected controls and system
- checking operational characteristics of control devices, signal conversion instruments and final control elements and using fault-finding techniques, including continuity testing and fault isolation for conformance/non-conformance to specifications
- dismantling/assembling and repairing items, including selecting replacement parts from manufacturers’/suppliers' catalogues, spare parts list or data sheets
- performing diagnostic checks and taking corrective action to bring system operation in line with specifications
- setting up test and calibration equipment to align control devices and controllers for optimum performance, configuring the system, and aligning multiple control loops in the correct sequence to specifications
- adjusting and calibrating control system components by setting up and monitoring recording equipment during the tuning phase to identify the effects of adjustment made on the system

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- changing system parameters online to meet specified requirements
- operating, adjusting and validating the system performance and returning control systems to service
- completing all service reports according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specification of each system component
- relevant data and/or trends
- system components and their function
- procedures for:
  - documenting information
  - obtaining work clearances
  - documenting control system tests and analysis
  - using test equipment
  - testing system configuration, control system components/elements, testing circuits and control lines
  - testing and monitoring the operation of selected controls
  - carrying out diagnostic checks
  - isolating the control system and its components
  - marking serviceable items for repair or replacement
  - dismantling/assembling items for repair or replacement and servicing item(s)
  - adjusting the system to conform to operational specifications
  - calibrating the control system components
  - aligning control devices and configuring the system
  - tuning controllers, multiple control loops and multi-element systems
  - recording signals and data during system tuning operations
  - changing parameters and operating and monitoring a control system
  - making final adjustments to ensure all control system components conform to specifications
  - returning to service and reporting/recording requirements
- reasons for:
  - observing the system in operation
  - selecting the chosen test equipment
  - identifying the adjustments/maintenance to be carried out
  - selecting the chosen diagnostic checks
  - selecting the chosen test and calibration equipment
  - any deviations/variations from specification

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- errors indicated by in-built devices
- deviations/variations from specification
- information for the given system, including:
  - all individual/multiple element loop device characteristics
  - controller mode principles
  - testing methods
  - calibration methods
  - adjustment methods
- equipment to be used and reasons for selecting the chosen equipment:
  - required to verify an apparent fault
  - used to test system configuration
  - required to undertake maintenance on item(s)
  - necessary to calibrate the control system components
  - necessary to carry out the alignment of the control devices
  - programming tools and techniques to be used
  - appropriate measuring techniques, tools and equipment
- adjustments/maintenance to be carried out
- diagnostic checks to be applied to the system to ensure correct operation of the system
- fault-finding and performing diagnostic tests to be applied to control devices, signal conversion instruments and final control elements
- causes of verified faults and the action to be taken to return the control system/component to specification
- appropriate replacement parts
- specifications of serviceable item(s)
- diagnostic checks to be carried out
- specifications of the equipment to be calibrated
- alignment specifications
- specifications of the controllers
- correct sequence of tuning
- recording equipment to be used
- adjustments that can be made to control system components
- effects of those adjustments on the calibration of the control system components
- requirements to be achieved by changing system parameters online and level of control to be achieved.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining/calibrating complex control systems at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18062 Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Modification History

Release 1. Supersedes and is equivalent to MEM18062B Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Application

This unit of competency defines the skills and knowledge required to select and install appropriate sensors and signal transmitters, maintain and diagnose correct operation of sensors and signal transmitters, and complete fault documentation.

It applies to planning corrective action; repairing, replacing and overhauling sensors and signal transmitters; and calibrating, testing, re-installing and recommissioning instrumentation sensors and signal transmitters.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/desoldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where diagnosis and repair of electronic equipment is undertaken to component level unit MEM18056 Diagnose and repair analog equipment and components and unit MEM18065 Diagnose and repair digital equipment and components, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **8**

Pre-requisite Unit

Path 1	MEM05001	Perform manual soldering/desoldering - electrical/electronic components
	MEM09002	Interpret technical drawing

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	MEM11011	Undertake manual handling
	MEM12004	Perform precision electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components
	MEM18057	Maintain/service analog/digital electronic equipment
Path 2	MEM09002	Interpret technical drawing
	MEM11011	Undertake manual handling
	MEM12002	Perform electrical/electronic measurement
	MEM12023	Perform engineering measurements
	MEM13015	Work safely and effectively in manufacturing and engineering
	MEM16006	Organise and communicate information
	MEM18001	Use hand tools
	MEM18002	Use power tools/hand held operations
	MEM18054	Fault find, test and calibrate instrumentation systems and equipment
	MEM18055	Dismantle, replace and assemble engineering components

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MEM18064 Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Select appropriate sensors, transmitters and final control elements for installation**	2.1	Determine specification requirements from data sheets, circuit diagrams, engineering drawings
		2.2	Interpret and define specification requirements through application of device characteristics and principles of operation
		2.3	Select equipment and final control elements having regard for measurement range, processes and environment according to their device characteristics, principles of operation and measurement capabilities, in conformance to specifications
3	**Install instrumentation sensors, transmitters and final control**	3.1	Install components using appropriate tools, test equipment, techniques and procedures
		3.2	Plan and cater for maintenance access during installation when mounting connections for power, signal, and process

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	elements		
		3.3	Diagnose installed components for correct operation using appropriate test equipment and procedures and assess results against specifications or manufacturers' technical data sheets
4	**Maintain and diagnose correct operation of sensors, transmitters and final control elements**	4.1	Apply preventative maintenance schedules and procedures to maintain components in optimum condition by interpreting device characteristics and principles of operation
		4.2	Clean and service elements to maintain optimum operating condition by interpreting device characteristics and principles of operation
		4.3	Determine correct operation or malfunction by diagnosing components within the system or as individual devices using appropriate test equipment and procedures
		4.4	Monitor operation of components and assess against predetermined specification or manufacturers' technical data
5	**Complete fault documentation and plan corrective action**	5.1	Document faults and malfunctions and/or report according to SOPs
		5.2	Plan corrective action autonomously or in consultation with appropriate personnel
6	**Analyse control loop and localise faults**	6.1	Obtain and interpret engineering specifications and technical information, control device, signal transmission and final element specifications and read and interpret system specifications, including operational data, and historical records and trends
		6.2	Carry out consultation with system operators and other relevant plant personnel and extract relevant data and document to procedures
		6.3	Observe operation of the system using sound knowledge

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			of all external control device characteristics, controller modes, signal transmission and final control devices
		6.4	Set up and apply appropriate signal transmission test equipment
		6.5	Test circuits and control lines to the level necessary to detect and localise fault
7	**Repair/replace/ overhaul sensors, transmitters and final control elements**	7.1	Examine and verify components for replacement, repair or overhaul using appropriate tools, test equipment, procedures and techniques
		7.2	Select and obtain replacement items from manufacturers' parts lists or catalogues to meet specifications
		7.3	Repair or overhaul faulty items to meet specifications
		7.4	Refit repaired, overhauled and replacement sensors, transmitters and final control elements
		7.5	Prepare refitted sensors, transmitters and final control elements for testing and calibration
8	**Calibrate and test instrumentation sensors, transmitters and final control elements**	8.1	Calibrate components against appropriate physical standards using appropriate calibration devices, test equipment, techniques and procedures
		8.2	Perform zero, span and range tests and assess results against manufacturers' instructions sheets
		8.3	Align components to manufacturers' instruction sheets by applying zero and span adjustments
9	**Return sensors, transmitters and final control elements and control loops to service**	9.1	Put components into service in conformance to specifications with due regard to process requirements, safety, installation/commissioning procedures and sequence of operation
		9.2	Adjust controller modes and actions according to specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	9.3 Test electrical and pneumatic transmission lines and take appropriate action, including the use of signal conditioning devices
	9.4 Return instrumentation to service, including configuring, calibrating, adjusting, tuning and validating system performance
	9.5 Return system to service

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Signal transmitting instrumentation sensing indicators include the use of one (1) or more of the following:	• mechanical • electrical • electronic (analog and digital)
Signals transmitted include measurement of one (1) or more of the following:	• pressure • temperature • level • flow rate • weight • density • other process variables

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Maintenance includes one (1) or more of the following:	• maintenance of control valves (including changing and reseating valve plugs) • adjustment of valve actuators (pneumatic, electrical and hydraulic) • maintenance and adjustment of pneumatic, electro-pneumatic and electronic valve positioners and signal converters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18062B Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18062 Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Modification History

Release 1. Supersedes and is equivalent to MEM18062B Install, maintain and calibrate instrumentation sensors, transmitters and final control elements

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting equipment specifications, circuit diagrams, engineering drawings, supplier catalogues and replacement components and obtaining relevant data with respect to installing, maintaining and calibrating instrumentation sensors, transmitters and final control elements
- interpreting device characteristics and principles of operation for cleaning and servicing of elements to maintain optimum operating condition
- consultation with relevant plant personnel
- selecting, installing and testing sensors, transmitters and final control elements to site and manufacturers' specifications
- obtaining and performing relevant scheduled/preventive maintenance schedules and determining correct function and recording the results
- identifying, localising, monitoring and reporting/recording faults and preparing sequential action plan to correct faults, including applying procedures to sequential and loop testing
- repairing/overhauling faulty items using appropriate tools, equipment, techniques and procedures to manufacturers' specifications
- refitting sensors, transmitters and final control elements and preparing for testing and calibration
- configuring, calibrating, testing and adjusting tuning and validating system performance against manufacturers' instruction sheets and returning system to service
- completing all service reports according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- characteristics, specifications and principles of operation of the sensors, transmitters and final control elements to be installed
- cleaning and servicing requirements to maintain optimum operating condition for elements
- relevant codes, standards, safety and legislative requirements
- criteria for selecting sensors, transmitters and final control elements and factors that determine the type of test equipment required
- procedures for testing, installing and maintaining sensors, transmitters and final control elements and for reporting/recording and monitoring faults and/or malfunctions in sensors, transmitters and final control elements
- tools, equipment and techniques required to install sensors and transmitters
- connections to be made to sensors, transmitters and final control elements
- variations of test results from specifications and probable causes of variations between test results and specifications
- test equipment and techniques required to determine correct function or malfunction of sensors, transmitters and final control elements
- probable causes of variations between test results and specifications
- need for systematic and/or sequential testing
- procedures for configuring, calibrating, testing, adjusting, tuning and validating system performance, including sensors, transmitters and final control elements
- physical standards against which sensors, transmitters and final control elements are to be calibrated
- devices, equipment and techniques required to calibrate sensors, transmitters and final control elements
- zero, span and range tests to be applied to the sensors, transmitters and final control elements
- procedures for recommissioning sensors, transmitters and final control elements.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing, maintaining and calibrating instrumentation sensors, transmitters and final control elements at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18063 Terminate signal and data cables

Modification History

Release 1. Supersedes and is equivalent to MEM18063B Terminate signal and data cables

Application

This unit of competency defines the skills and knowledge required to terminate signal and data cables and covers fixing, securing, identifying and marking conductors and cables.

Where termination of cables is undertaken to pre-determined specifications and procedures then unit MEM03004 Perform electronic/electrical assembly (production) should also be selected.

Where termination and connection of other cables is required unit MEM10002 Terminate and connect electrical wiring should also be selected.

Where termination and connection of specialist cables is required unit MEM10011 Terminate and connect specialist cables should also be selected.

Where higher levels of electrical/electronic measures are required unit MEM12004 Perform precision electrical/electronic measurement should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering – electrical/electronic components
MEM09002	Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify and mark conductors/cables**	2.1	Identify cables and conductors using appropriate test equipment and techniques
		2.2	Label cables and conductors in accordance with procedures, legislative requirements and statutory regulations to specifications
3	**Prepare and terminate cable**	3.1	Obtain termination requirements and specifications
		3.2	Prepare cable ends and terminate cables to

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		specifications, legislative requirements and statutory regulations utilising appropriate tools and techniques
	3.3	Test/examine terminations for compliance with specifications
4 **Fix/secure cables**	4.1	Fix/secure cables utilising appropriate fixing/securing techniques

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Legislative requirements and statutory regulations include one (1) or more of the following:	• ACA Technical Standards AS/ACIF008, AS/ACIF009 • SAA Communications Cabling Manual (Open) • AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) • Telecommunications Act 1997

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Types of cables include one (1) or more of the following:	• thermocouple/compensator cables, including MIMS • transmission cables • thermoplastic/elastomer insulated/sheathed • compensating cables • coaxial • telephone • Category 5 • optical fibre • extra low voltage control cables
Tools include one (1) or more of the following:	• Krone tool • cable strippers • crimping tools, e.g. RJ45 crimping tool • slitter tool • pliers
Terminations include one (1) or more of the following:	• crimp • wire wrap (non-insulated and pre-insulated) • solder • connectors • multi-terminal plugs and sockets, • fibre optics • coaxial • terminal blocks

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18063B Terminate signal and data cables

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18063 Terminate signal and data cables

Modification History

Release 1. Supersedes and is equivalent to MEM18063B Terminate signal and data cables

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, data sheets, legislative requirements and statutory regulations and obtaining relevant data with respect to terminating signal and data cables
- identifying cables and conductors and label in accordance with requirements, procedures and regulations
- preparing and terminating cables using appropriate tools and techniques to specifications
- testing terminations for compliance with specifications
- fixing/securing cables in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- legislative requirements and statutory regulations, including ACA Technical Standards AS/ACIF008, AS/ACIF009, SAA Communications Cabling Manual (Open), AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules and Telecommunications Act 1997
- test equipment, techniques and procedures to be used to identify cables and conductors
- labelling requirements and procedures for labelling cables and conductors
- termination requirements, specifications and procedures, tools and techniques for preparing and terminating cables
- procedures for testing cables and terminations
- factors that influence selection of fixing/securing techniques.

Assessment Conditions

- Assessors must:

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  - have vocational competency in terminating signal and data cables at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18064 Maintain instrumentation system components

Modification History

Release 1. Supersedes and is equivalent to MEM18064B Maintain instrumentation system components

Application

This unit of competency defines the skills and knowledge required to maintain instrument system components of a primarily mechanical nature.

Application of this unit would involve identifying instrumentation system components as well as inspecting and assessing component condition/operation using instrumentation principles and methods and interpreting information from data sheets and circuit diagrams in order to make repairs and replacements to predetermined site or manufacturer specifications.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check instrumentation system components**	2.1	Identify system components through interpreting the characteristics and operational function of each system component
		2.2	Inspect the operational function of each component and test in accordance with procedures
		2.3	Assess operation of each component against specifications
3	**Identify, repair/replace faulty instrumentation system components**	3.1	Localise/isolate faulty system components and confirm the malfunction by inspection and testing using appropriate techniques, procedures and safety requirements
		3.2	Dismantle faulty system components and repair according to manufacturers'/site specifications
		3.3	Select replacement parts from manufacturer catalogues and listings to required specifications
		3.4	Reassemble system components and test for correct operation and assessment against specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Confirm correct operation of the instrumentation system according to SOPs
	3.6 Adopt appropriate follow-up procedures
	3.7 Complete service reports in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Application includes one (1) or more of the following:	• fixed plant and equipment • mobile plant and equipment • marine installations • machine and process operations
Components include one (1) or more of the following:	• sensors • transmitters • converters • indicators • analysers • controllers • transducers • power supplies • removable circuit boards • sensor units associated with determining/controlling density, level, flow, temperature and composition of a range of

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

materials

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18064B Maintain instrumentation system components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18064 Maintain instrumentation system components

Modification History

Release 1. Supersedes and is equivalent to MEM18064B Maintain instrumentation system components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting instrumentation circuits, specifications, drawings, data sheets and manuals and obtaining relevant data with respect to the operation of the instrumentation systems/equipment
- locating, inspecting and testing a range of instrumentation system components using appropriate test equipment, techniques and procedures
- fault finding components and confirming malfunction by inspection and testing using instrumentation principles and procedures
- dismantling/repairing/reassembling faulty components and sourcing replacement parts from manufacturer/supplier catalogues
- checking repaired/replaced instrumentation system components for correct operation and completing all service reports in accordance with SOPs
- undertaking zero, span and range checks and calibrating instrumentation systems/equipment to operational specifications
- recording/documenting test results in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- instrumentation principles, including controlling density, level, flow, temperature and composition of a range of materials
- effects of resistance, capacitance, inductance and impedance (R, L, C) upon electrical circuit
- interpretation requirements of schematic, wiring and block diagrams and circuits
- basic principles of hydraulic/pneumatic/electrical flow
- procedures for:
  - inspecting and testing instrumentation system components and equipment to be used

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  - dismantling, repairing, reassembling and testing faulty instrumentation system components
  - recording and completing service reports
- purpose, operational function and specifications, including deviations of instrumentation system components
- correct operation of the instrumentation system.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining instrumentation system components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18065 Diagnose and repair digital equipment and components

Modification History

Release 1. Supersedes and is equivalent to MEM18065B Diagnose and repair digital equipment and components

Application

This unit of competency defines the skills and knowledge required to locate faults in digital electronic equipment or sub-assemblies and replace faulty components.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/de-soldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where termination of cables is required unit MEM10002 Terminate and connect electrical wiring and unit MEM18063 Terminate signal and data cables, should also be selected as appropriate.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **10**

Pre-requisite Unit

MEM05001 Perform manual soldering/desoldering - electrical/electronic

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	components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18057	Maintain/service analog/digital electronic equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine system/equipment functions and principles by reference to equipment manuals and circuit diagrams
		2.2	Run built-in test functions and check and review fault indicators error codes and appropriate maintenance records
		2.3	Reproduce fault symptoms and verify using fault-finding

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		techniques
	2.4	Isolate faulty equipment and remove from system using appropriate tools and techniques
	2.5	Check and test equipment using appropriate test equipment and fault finding techniques
	2.6	Identify faulty component and/or isolate fault cause
3 **Repair/replace faulty components**	3.1	Remove faulty component using appropriate tools and techniques
	3.2	Repair/replace faulty component in accordance with site/manufacturers' recommended procedures
	3.3	Refit repaired/replacement components
	3.4	Refit repaired equipment to system
	3.5	Check and test systems/equipment for compliance with specifications using appropriate test procedures and equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• digital hardware • communication • consumer audio/video • electronic appliances • scanning systems • security/fire systems • power supplies • test equipment
Fault-finding techniques include one (1) or more of the following:	• signal injection • substitution • monitoring • measurement • heating/cooling • sound • visual • touch • smell • use of inbuilt software and hardware diagnostics
Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • cathode ray oscilloscopes • frequency counters • signal generators • digital probes

Components include (1) one or more of the following:	• discrete component assemblies
	• individual components, including:
	  • resistors
	  • switching devices
	  • capacitors
	  • transformers
	  • solenoids
	  • tubes
	  • semi-conductors

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- transistors
- ICs
- digital timers
- gate arrays
- transmitters
- converters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18065B Diagnose and repair digital equipment and components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18065 Diagnose and repair digital equipment and components

Modification History

Release 1. Supersedes and is equivalent to MEM18065B Diagnose and repair digital equipment and components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting equipment specifications, manuals, circuit and schematic diagrams, maintenance records and supplier catalogues and obtaining relevant data with respect to diagnosing and repairing digital equipment and components
- checking electronic equipment/sub-assemblies, components, connections and terminations for compliance to specifications
- locating, reading/recording and diagnosing built-in fault indicators and obtaining error code interpretation documents and running test functions and recording faults and/or equipment status indicated by built-in test functions/displays
- checking and testing equipment using appropriate test equipment and fault-finding techniques for compliance to specifications
- reproducing fault symptoms in the electronic equipment and verifying faults using appropriate test equipment and fault-finding techniques to locate and isolate faulty component or fault cause
- removing and replacing faulty components from the electronic equipment
- adjusting/tuning, calibrating and testing the repaired electronic equipment/sub-assemblies to specifications
- returning the repaired equipment and components to service in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- implications of electro-static discharge (ESD) upon the electronic equipment
- analog and digital electronics, including amplifiers, oscillators, power suppliers, filters, transistors, ICs, digital timers, gate arrays, transmitters and converters
- function(s) of the electronic equipment/sub-assembly
- procedures for:

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  - running built-in test functions
  - verifying faults in electronic equipment/sub-assemblies
  - isolating electronic equipment/sub-assemblies
  - removing sub-assemblies from electronic equipment
  - testing faulty sub-assemblies
  - removing and repairing/replacing faulty components from electronic equipment
  - fitting repaired/replaced components into sub-assemblies and sub-assemblies into electronic equipment
  - testing electronic equipment/sub-assembly performance
- errors indicated by built-in devices
- symptoms of the fault in the electronic equipment/sub-assembly and purpose of reproducing fault symptoms
- test equipment and techniques necessary to confirm electronic equipment/sub-assembly faults
- tools and techniques to be used to remove/refit/repair/replace the faulty sub-assemblies/component from the electronic equipment
- operational specifications of the sub-assembly
- equipment and techniques to be used to test the faulty sub-assemblies/component and probable causes of component failure
- operational specifications of the electronic equipment/sub-assembly/component
- test equipment and techniques necessary to check electronic equipment/sub-assembly performance.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and repairing digital equipment and components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

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MEM18066 Diagnose and repair microprocessor-based equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18066B Diagnose and repair microprocessor-based equipment

Application

This unit of competency defines the skills and knowledge required to locate, replace/repair faulty components in microprocessor-based equipment.

It applies to situations in which the individual has sufficient information and access to microprocessor components to diagnose the functioning of elements within the microprocessor and requires an understanding of machine and assembly language and address and bus systems.

Where diagnosis of analog components is required unit MEM18056 Diagnose and repair analog equipment and components should also be selected.

Where routine fault finding within microprocessor systems is required unit MEM18057 Maintain/service analog/digital electronic equipment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **6**

Pre-requisite Unit

MEM05001	Perform manual soldering/desoldering - electrical/electronic components
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12004	Perform precision electrical/electronic measurement

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MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18057	Maintain/service analog/digital electronic equipment
MEM18065	Diagnose and repair digital equipment and components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate fault**	2.1	Determine equipment function and principles by reference to schematics, circuit diagrams, flow charts and equipment manuals
		2.2	Run built-in test functions and interpret results
		2.3	Reproduce fault symptoms and verify using fault-finding techniques
		2.4	Identify faulty or defect component/s and/or isolate fault cause

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Replace/repair faulty components**	3.1 Remove faulty component using and appropriate tools and techniques
	3.2 Repair/replace faulty component/s in accordance with site/manufacturers' recommended procedures
	3.3 Re-fit repaired/replaced component/s
	3.4 Check and test equipment for compliance to specifications utilising correct and appropriate test procedures and equipment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes one (1) or more of the following:	• digital hardware • sub-assemblies of systems • discrete equipment used in computer, communication, consumer audio/video, electronic appliances, scanning systems, security/fire systems, power supplies and test equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fault-finding techniques include one (1) or more of the following:

- signal injection
- substitution
- monitoring
- measurement
- heating/cooling
- sound
- visual
- touch
- smell
- use of inbuilt software and hardware diagnostics

Test equipment includes one (1) or more of the following:

- continuity testers
- ammeters
- voltmeters
- cathode ray oscilloscopes
- frequency counters
- signal generators
- digital probes
- pulse generators
- computer and computer software
- data analysers

Components include (1) one or more of the following:

- discrete component assemblies
- individual components, including:
  - resistors
  - switching devices
  - capacitors
  - transformers
  - solenoids
  - tubes
  - semi-conductors
  - transistors
  - ICs
  - digital timers
  - gate arrays
  - transmitters
  - converters

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- microprocessors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18066B Diagnose and repair microprocessor-based equipment

Links

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Assessment Requirements for MEM18066 Diagnose and repair microprocessor-based equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18066B Diagnose and repair microprocessor-based equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting equipment specifications, manuals, circuit and schematic diagrams, maintenance records and supplier catalogues and obtaining relevant data with respect to diagnosing and repairing microprocessor-based equipment
- locating, reading/recording and diagnosing built-in indicators and obtaining error code interpretation documents and running test functions and recording faults and/or equipment status indicated by built-in test functions/displays
- reproducing fault symptoms in the microprocessor-based equipment and verifying faults using appropriate test equipment and fault-finding to locate and isolate faulty component or fault cause
- checking microprocessor-based equipment, electronic equipment/sub-assemblies, components, connections and terminations for conformance to specifications
- removing and replacing faulty components and/or microprocessor from the electronic equipment/sub-assemblies
- checking and testing equipment using appropriate test equipment and fault-finding techniques for conformance with specifications
- adjusting/tuning, calibrating and testing the repaired microprocessor-based equipment to specifications
- returning the repaired equipment and components to service in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- implications of electro-static discharge (ESD) upon the electronic equipment
- microprocessor systems, architecture, circuits and dedicated chips
- function(s) of the microprocessor-based equipment
- electronic principles utilised in the operation of the microprocessor-based equipment

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- procedures for:
  - running built-in test functions
  - verifying faults in microprocessor-based equipment
  - testing faulty microprocessor-based equipment
  - testing microprocessor-based equipment performance
  - removing/refitting/repairing/replacing faulty components from microprocessor-based equipment and tools and techniques to be used
- errors indicated by built-in devices
- symptoms of the fault in the microprocessor-based equipment and purpose of reproducing fault symptoms
- test equipment and fault-finding techniques necessary to confirm microprocessor-based equipment faults
- test equipment and techniques to be used to test the faulty microprocessor-based equipment and probable causes of component failure
- reasons for identifying the faulty component for repair or replacement
- operational specifications of the microprocessor-based equipment
- test equipment and fault-finding techniques necessary to check the microprocessor-based equipment performance.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and repairing microprocessor-based equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18067 Tune control loops - multi controller or multi element systems

Modification History

Release 1. Supersedes and is equivalent to MEM18067B Tune control loops – multi controller or multi-element systems

Application

This unit of competency defines the skills and knowledge required to determine and record control loop responses in open and closed loop modes, tune control loops and complete service records.

Included is the application of step response (open loop tuning calculations and closed loop ultimate sensitivity trials) to achieve specified loop characteristics in conformance to operational specifications.

Where fault-finding is required to electronic component level unit MEM18056 Diagnose and repair analog equipment and components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18054	Fault find, test and calibrate instrumentation systems and equipment
MEM18055	Dismantle, replace and assemble engineering components

Plus, one or more of the following, including their prerequisites:

MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
MEM18064	Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine control loop characteristics**	2.1	Examine engineering specifications, technical information and historical process, records and trends for relevant data
		2.2	Carry out consultation with system operators and other relevant plant personnel and extract relevant data and document to procedures
		2.3	Read programmed maintenance/service reports and note relevant data
		2.4	Analyse data and ascertain control loop characteristics

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Record control loop responses**	3.1	Record control loop responses in open and closed loop mode using chart recorders and data loggers
		3.2	Test unit for tuning using appropriate diagnostic techniques
		3.3	Analyse diagnostic results against specifications
4	**Tune control loops**	4.1	Perform tuning operations by applying control loop device characteristics, controller mode principles and adjustment methods using appropriate equipment, procedures and techniques
		4.2	Monitor and adjust control loop components during controller tuning operation using test recording equipment
		4.3	Apply step response – open loop tuning calculations to achieve specified loop characteristics
		4.4	Use closed loop tuning methods incorporating ultimate sensitivity and systematic trials to achieve specified loop characteristics
		4.5	Use correct sequence of tuning on multi controllers and/or multi element systems to achieve specified characteristics
		4.6	Tune control loops to optimum mode settings
		4.7	Recommission process control loop to specifications
5	**Complete service reports**	5.1	Adopt appropriate follow-up procedures
		5.2	Complete service reports according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Historical trends include one (1) or more of the following:	• supervisory control and data acquisition (SCADA) • charts • chart recorders and data loggers • equipment conditioning monitoring
An open and closed loop system includes:	• final control elements • process measuring devices • converters • controllers • process signals
Test and recording equipment for the monitoring and adjustment of control loop tuning includes the use of one (1) or more of the following:	• pneumatic • analog electronic • digital electronic

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18067B Tune control loops – multi controller or multi-element systems

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Assessment Requirements for MEM18067 Tune control loops - multi controller or multi element systems

Modification History

Release 1. Supersedes and is equivalent to MEM18067B Tune control loops – multi controller or multi-element systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering specifications, technical information, diagrams and drawings, documents and historical records and obtaining relevant data with respect to tunning control loops
- consulting with system operators and other relevant personnel with respect to the control loop characteristics, including an open and closed loop system and confirming function/malfunction of the system and/or its components
- checking operational characteristics of the control devices, signal conversion instruments and final control elements for conformance to specifications
- locating, reading and interpreting in-built fault indicators and error codes and identifying faults/defects in control system
- obtaining relevant pneumatic, electrical and electronic circuit diagrams and testing and monitoring control loop for correct operation and recording the operational responses of the control system/loop
- using fault-finding and diagnostic techniques and procedures throughout the monitoring and testing phase and comparing collected data with the operational specifications of the control system
- dismantling/disassembling serviceable items using appropriate tools, techniques and procedures
- setting and adjusting the controller modes using appropriate test and calibration equipment for the monitoring and adjustment of control loop tuning
- checking the control instrumentation for correct zero, span and range and making final adjustments, as required
- tuning the control loop to optimum mode settings and recommissioning the control system
- completing all service reports, including appropriate follow up procedures in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- proportional integral differential (PID) control loops tuning/calibration techniques
- mathematical computations, including algebra, exponentials and logarithms, equations, graphs, charts, vectors, complex numbers and Boolean algebra
- relevant data, including information from in-built devices on the control loop characteristics
- specifications of each system component
- control programming
- supervisory control and data acquisition (SCADA) systems, programmable logic controller (PLC) systems, distributive control systems (DCS) and computer-based systems
- procedures for:
  - documenting/reporting information
  - documenting control system tests and analysis
  - isolating and testing the control system and its components
  - verifying apparent faults in circuits and/or control system components
  - dismantling/ disassembling components for repair or replacement
  - assembling repaired and/or replacement items
  - calibration of control system components and necessary equipment
  - checking control instruments for zero, span and range
  - making final adjustments to ensure all control system components conform to specification
  - commissioning the control system
- signal transmission, including the principles of operation of the final control element, procedures for calibrating and adjusting the control system
- correct function of the circuits and components within the control loop
- calibration and adjustment methods for the control loop devices
- configuration of the digital control system software
- operational responses and procedures for monitoring and recording test and operational data
- fault-finding and diagnostic techniques throughout the monitoring and testing process
- deviations/variations from specification
- correct maintenance procedures for serviceable item(s)
- adjustments which affect the calibration to control system components
- controller modes and actions
- reporting/recording requirements associated with the commissioning of the control system
- follow-up actions to be undertaken after maintaining/repairing control system instrumentation.

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Assessment Conditions

- Assessors must:
  - have vocational competency in tuning control loops – multi controller or multi-element systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18069 Maintain, repair instrumentation process control analysers

Modification History

Release 1. Supersedes and is equivalent to MEM18069B Maintain, repair instrumentation process control analysers

Application

This unit of competency defines the skills and knowledge required to perform preventative maintenance on process control analysers; complete fault documentation; plan corrective action; repair, replace, overhaul, calibrate and test; re-install and recommission process control analysers and applies to the use of electrical and electronic test equipment for transmission and signal measurement.

Central to the task is the interpretation of electrical and electronic circuit diagrams and the interpretation of calibration and analysis data and procedures in accordance with manufacturers' data sheets.

Where soldering of components is required to advanced or military specifications, where the reliability of electrical connections is critical, or where surface mounted devices are being soldered/desoldered then unit MEM05002 Perform high reliability soldering and desoldering should also be selected.

Where diagnosis and repair of electronic equipment is undertaken to component level then unit MEM18056 Diagnose and repair analog equipment and components and unit MEM18065 Diagnose and repair digital equipment and components, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **6**

Pre-requisite Unit

MEM09002 Interpret technical drawing

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MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18054	Fault find, test and calibrate instrumentation systems and equipment
MEM18055	Dismantle, replace and assemble engineering components

Plus, one or more of the following including their prerequisites:

MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
MEM18064	Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Perform preventative maintenance on process control analysers**	2.1	Determine specification requirements from manufacturers' manuals, maintenance schedules and other relevant documents
		2.2	Interpret and define specification requirements by applying principles of operation and process control analyser characteristics
		2.3	Perform preventative maintenance schedules on process control analysers to service and maintain analysers within defined specifications
		2.4	Diagnose specified process control analysers within the system or within the laboratory to determine correct operation or malfunction using appropriate electrical and electronic test equipment, techniques, data and procedures
		2.5	Identify and confirm faults and malfunctions
3	**Complete fault documentation and plan corrective action**	3.1	Document or report faults and malfunctions according to SOPs
		3.2	Plan corrective action autonomously or in consultation with appropriate personnel and action
4	**Repair, replace, overhaul process control analysers**	4.1	Examine process control analysers and verify for repair, replacement or overhaul
		4.2	Select replacement items from manufacturers' parts lists or catalogues according to specifications
		4.3	Repair or overhaul faulty items using appropriate principles, techniques, tools, equipment and procedures
		4.4	Refit repaired, overhauled and replacement process control analysers
		4.5	Prepare refitted process control analysers for testing and calibration

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
5	**Calibrate and test process control analysers**	5.1	Calibrate process control analysers against appropriate physical standards using correct calibration devices, equipment, techniques and procedures
		5.2	Test calibrated process control analysers using appropriate test equipment
		5.3	Collect and interpret calibration and analysis data
		5.4	Assess calibration and analysis data in accordance with manufacturers' data sheets, codes of practice and safety procedures
6	**Re-install and recommission process control analysers**	6.1	Put process control analysers into service to specifications with due regard to process requirements, codes of practice, safety, commissioning procedures and techniques
		6.2	Complete service reports in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tasks include the use of one (1) or more of the following:	• hygrometers • wet and dry bulb • calibration of gas cylinders and gas supply equipment • the use of chemical calibration solutions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- the use of special calibration devices specific to chemical detectors
- gas analysis devices
- liquid analysis devices

Safety codes of practice includes one (1) or more of the following:

- identification handling and appropriate use of high pressure gas cylinders
- equipment
- chemical solutions

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18069B Maintain, repair instrumentation process control analysers

Links

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Assessment Requirements for MEM18069 Maintain, repair instrumentation process control analysers

Modification History

Release 1. Supersedes and is equivalent to MEM18069B Maintain, repair instrumentation process control analysers

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering specifications, technical information, circuit diagrams, engineering drawings, manufacturers' manuals and supplier catalogues and obtaining relevant data with respect to maintaining, repairing instrumentation process control analysers
- performing scheduled/preventative maintenance and determining correct function or the malfunction of process control analysers and recording test results
- identifying, monitoring and localising faults by confirming correct action of process control analysers using a structured diagnostic approach, recording/reporting faults and malfunctions and preparing sequential action plan to correct faults
- checking process control analysers and marking for replacement, repair or overhaul
- repairing/overhauling faulty items using appropriate tools, equipment, techniques and procedures to manufacturers' specifications
- refitting process control analysers and preparing for testing and calibration
- calibrating process control analysers against appropriate physical standards using appropriate calibration devices, equipment and techniques
- testing calibrated process control analysers using appropriate equipment by interpreting relevant calibration and analysis data with respect to the given process controller
- recommissioning process control analysers
- completing all service reports according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- specifications for the process control analyser to be installed
- maintenance to be undertaken and the frequency at which process control analysers are to be maintained

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- procedures for:
  - maintaining process control analysers
  - determining correct function or the malfunction of process control analysers
  - recording test results and procedures for monitoring apparent faults detected from test results
  - reporting/recording faults and/or malfunctions in process control analysers
  - fitting/refitting process control analysers including preparing items
  - calibrating and recommissioning process control analysers
  - reporting/recording service undertaken on process control analysers and reasons for recording service undertaken
- test equipment and diagnostic techniques required to determine correct function or malfunction of process control analysers
- probable causes of variations between test results and specifications
- action to be taken to return the process control analysers to specification and reasons for undertaking the proposed actions
- persons to be consulted in planning the corrective action and sequence of actions to be taken
- tools, equipment and techniques required to test components and reasons for marking components for repair, replacement and/or overhaul
- specifications for the component(s) to be replaced
- preparation requirements of items to be fitted/refitted
- tools, techniques and equipment required to repair/overhaul and fit/refit process control analysers
- preparation requirements of process control analysers prior to testing and calibration
- physical standards against which process control analysers are to be calibrated
- devices, equipment and techniques required to calibrate process control analysers
- equipment and procedures for testing calibrated process control analysers
- probable causes of any variations/deviations detected
- action to be taken to return the process control analyser to specification and reasons for undertaking the proposed action(s)
- appropriate measuring techniques, tools and equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, repairing instrumentation process control analysers at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18071 Connect and disconnect fluid conveying system components

Modification History

Release 1. Supersedes and is equivalent to MEM18071B Connect/disconnect fluid conveying system components

Application

This unit of competency defines the skills and knowledge required to safely remove and replace a range of fluid conveying components and assemblies, and inspect/test fluid conveying assemblies.

It applies to repairs and replacement to pressure and suction systems on fixed and mobile plant/equipment, including marine, heavy plant and manufacturing plant applications with system pressures range of 10.5 MPa to 35 MPa, ranging up to 70 MPa.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

This unit should not be selected when unit MEM18055 Dismantle, replace and assemble engineering components or unit MEM27017 Maintain, fault find and rectify hydraulic systems for mobile plant has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Disconnect fluid conveying components and assemblies**	2.1	Carry out safety/risk assessment, identify potentially hazardous situations/conditions and position safety devices
		2.2	Note, record and label lay out of fluid conveying conductor
		2.3	Identify faulty component/assembly using specific troubleshooting procedures, reference documents and fluid power principles
		2.4	Disconnect and remove fluid conveying components and assemblies using appropriate tools, equipment, procedures and techniques
		2.5	Seal open system adequately with standard or special purpose sealing materials

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Obtain replacement parts**	3.1	Select replacement parts from manufacturer catalogues and other relevant reference sources according to international standards and specifications
4	**Test and store components**	4.1	Pressure test fluid conveying assemblies and individual components according to industry and manufacturer standards and using fluid power principles
		4.2	Assess and note condition
		4.3	Clean, seal and store components/assemblies according to industry and manufacturer standards
5	**Connect fluid conveying components and assemblies**	5.1	Check connections and prepare for reconnection
		5.2	Connect components and assemblies to equipment to specifications using appropriate techniques
		5.3	Remove tagged out equipment, signage and safety blocking devices according to SOPs
		5.4	Check equipment and fluid conveying systems and functional test, including in-situ and high pressure test rigs for correct operation according to manufacturer and industry standards
6	**Report results**	6.1	Follow reporting and certification procedures
		6.2	Complete all relevant information

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fluid conveying applications include one (1) or more of the following:	• hydraulic • pneumatic • water • gas • acids/corrosives/alkalines • abrasives • petroleum • other dry/wet media
Potentially hazardous situations/ conditions include one (1) or more of the following:	• accumulated pressure • contamination • fluid handling
Components and assemblies include one (1) or more of the following:	• high pressure seals • seats • hoses • tubes • pipes • fittings • connectors • adaptors and anchors • other associated attachments

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18071B Connect/disconnect fluid conveying system components

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Assessment Requirements for MEM18071 Connect and disconnect fluid conveying system components

Modification History

Release 1. Supersedes and is equivalent to MEM18071B Connect/disconnect fluid conveying system components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and obtaining relevant data with respect to connecting and disconnecting fluid conveying system components
- identifying potential hazardous situations and carrying out a risk assessment and isolating, tagging, locking off and displaying signage using appropriate procedures
- locating faulty component, neutralising pressures and disconnecting and removing fluid conveying components and assemblies using appropriate techniques, tools and equipment and sealing open system with appropriate sealing materials
- selecting replacement components from manufacturer catalogues and other reference sources
- performing pressure testing on fluid conveying assemblies and individual components using fluid power principles and undertaking condition and serviceability assessment and storing components/assemblies according to industry standards
- connecting components and assemblies to equipment, removing tagged out equipment, signage and safety blocking devices
- testing equipment and fluid conveying systems using appropriate test equipment and rigs for compliance to manufacturer and industry standards
- completing routine reports and certification procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- different sources of stored energy and their applications
- work health and safety (WHS) responsibilities of customer and self
- safety/security lock-off devices and signage and procedures and reasons for installing lock-off devices and signage
- basic functions of fluid power systems, including:

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  - effects of heat and contamination
  - pressures
  - flow rates and temperatures
  - hose strength and size
  - effect of media on hoses
  - test
  - operational and burst pressures
- techniques and safety practices for pressure testing
- tools, techniques and procedures for removal of components
- troubleshooting techniques
- standard and specific sealing materials and techniques
- different fluid conveying parts and their function
- techniques and safety practices for pressure testing
- criteria for assessment
- methods of cleaning, sealing and storage
- techniques and criteria for connection and confirming connection
- techniques, procedures and safety practices. including neutralisation of pressures.

Assessment Conditions

- Assessors must:
  - have vocational competency in connecting and disconnecting fluid conveying system components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18072 Manufacture fluid conveying conductor assemblies

Modification History

Release 1. Supersedes and is equivalent to MEM18072B Manufacture fluid conveying conductor assemblies

Application

This unit of competency defines the skills and knowledge required to perform assembly and functional testing of fluid conveying components and assemblies.

Conductor assemblies may apply to positive and negative pressure systems on fixed and mobile plant/equipment, including marine, heavy plant and manufacturing plant applications with system pressures range of 10.5 MPa to 35 MPa, ranging up to 70 MPa.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

This unit should not be selected when unit MEM18055 Dismantle, replace and assemble engineering components or unit MEM27017 Maintain, fault find and rectify hydraulic systems for mobile plant has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Manufacture/repair fluid conveying system conductors and assemblies**	2.1	Identify conductor requirements and select appropriate materials/fittings to suit application
		2.2	Prepare conductor materials for assembly
		2.3	Assemble conductors to specification
		2.4	Dismantle faulty fluid conveying system conductors and repair to manufacturer/industry standards and specifications
3	**Check/test conductor assemblies**	3.1	Test operation of fluid conveying components and assemblies against current industry standards and manufacturer specifications using fluid power principles and relevant reference documents
		3.2	Identify faulty fluid conveying components and assemblies and confirm failure and/or potential to fail by

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	inspection and testing using fluid power conveying principles, procedures, equipment and safety practices
	3.3 Assemble manufactured/repaired components, test in-situ or using high pressure test rigs and verify operation to ensure compliance with required specifications and standards

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components and assemblies include one (1) or more of the following:	• high pressure seals • seats • hoses • tubes • pipes • fittings • connectors • adaptors and anchors • other associated attachments
Fluid conveying applications include (1) one or more of the following:	• hydraulic • pneumatic • water • gas • acids/corrosives/alkalines • abrasives

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- petroleum
- other dry/wet media

Manufactured/assembled includes the use of one (1) or more of the following:

- hose – skive and measurement tools
- crimping and cleaning machines
- lathes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18072B Manufacture fluid conveying conductor assemblies

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18072 Manufacture fluid conveying conductor assemblies

Modification History

Release 1. Supersedes and is equivalent to MEM18072B Manufacture fluid conveying conductor assemblies

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting tables and charts, equipment specifications, circuit and schematic diagrams and obtaining relevant data with respect to manufacturing fluid conveying conductor assemblies
- preparing and assembling conductors using appropriate tools and equipment to specifications and industry standards
- performing pressure testing on fluid conveying assemblies and individual components and identifying faulty items and confirming failure or potential to fail and carrying out appropriate remedial action
- testing and verifying correct operation of components to ensure compliance to manufacturer and industry standards using appropriate test equipment and rigs
- completing routine reports and certification procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- conductor materials and fittings for a range of applications and media (fluid types)
- methods for preparation of different conductors, including hose and pipe assemblies
- different methods for assembling hose and pipe assemblies
- dismantle and repair procedures
- operational function and characteristics of fluid conveying installation and application category types
- industry standards and manufacturer specifications
- procedures to assemble, clean, test and assess operation
- fluid power conveying principles, procedures and safety requirements.

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Assessment Conditions

- Assessors must:
  - have vocational competency in manufacturing fluid conveying conductor assemblies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18083 Handle fluorocarbon refrigerants according to regulations

Modification History

Release 1. New Unit

Application

The unit of competency defines the knowledge and skills required to undertake work on refrigeration and air conditioning in a manner consistent with requirements of the Australian Refrigeration Council (ARC) for working with ozone depleting refrigerants. The unit's focus is on compliance and awareness of global warming and the dangers of ozone depleting substances. The unit does not cover the technical skills required for typical refrigeration and air conditioning trade tasks such as installing, servicing, repair or decommissioning of equipment or the testing, recovering, evacuating or charging of refrigerants.

This unit should be selected in conjunction with relevant technical units if the learner intends to apply to the ARC for a Refrigerant Handling Licence – qualified persons (ARCTICK licence). Other MEM units are specified where a person intends to apply for other ARC licences, including those covering vehicle or split system related work.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: A

Unit Weight: 1

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Demonstrate knowledge of global warming and ozone layer depletion**	1.1	Identify the role of the ozone layer in the earth's climate and human health
		1.2	Explain effects of global warming and consequences of ozone layer depletion
		1.3	Explain role of ozone depleting substances (ODS) and synthetic greenhouse gas (SGG) emissions in global warming
2	**Demonstrate knowledge of regulatory requirements in regards to fluorocarbon refrigerants**	2.1	Explain ARC licence classes and relationship to HVAC/R equipment
		2.2	Identify requirements to apply for a Refrigerant Handling Licence – Qualified Persons Licence
		2.3	Explain licence period and procedures to obtain or renew a licence
		2.4	Explain refrigerant coding and numbering system, including classification for toxicity and flammability
		2.5	Identify the range of refrigerants covered by ARC licencing
		2.6	Identify role of ODS and SGG handling licences and trading authorisations in refrigerant handling and disposal
		2.7	Access information in the Australia and New Zealand Refrigerant Handling Code of Practice relating to specific work tasks
3	**Determine job requirements**	3.1	Identify job requirements from customer order, work specification or other enterprise procedure
		3.2	Determine if required work includes risk of refrigerant emission
		3.3	Check refrigerant handling equipment is available and serviceable

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Plan work tasks to conform to regulatory requirements
4	**Assess equipment and refrigerant status prior to commencement of work**	4.1	Check refrigerant label on equipment and confirm refrigerant is appropriate for equipment
		4.2	Adjust work plan to avoid any venting if refrigerant is unable to be positively identified
		4.3	Identify if refrigerant is flammable and if so check for potential ignition sources and provide appropriate ignition source protection or elimination
		4.4	Conduct visual check and other tests for gross leaks
		4.5	Conduct other appropriate leak tests
		4.6	Adjust work plan to include rectification of leaks
5	**Apply regulations, codes and standards to refrigeration and air conditioning work**	5.1	Apply regulations, codes and standards to installation, servicing, repair or decommissioning of equipment and systems
		5.2	Establish or maintain appropriate ventilation and temporary flammable zone for equipment with flammable refrigerant
		5.3	Set and locate gas detectors appropriately for type of equipment
		5.4	Conduct leak testing according to regulations, codes and standards
		5.5	Evacuate equipment according to regulations, codes and standards
		5.6	Charge and recover refrigerants using prescribed methods and equipment
		5.7	Ensure work on piping, valves and gauges is consistent with regulations, codes and standards

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Handle refrigerant includes the following:	• any actions with an ARC prescribed refrigerant, or a component of refrigeration and air conditioning equipment, that carries the risk of its emission
Prescribed methods and equipment include the following:	• methods and equipment as described in ARC codes and regulations or referenced by the ARC • manufacturer's instructions where available except where the instructions would lead to emission of refrigerant
Refrigerant handling equipment includes the following:	• cylinders
Contamination includes one or more of the following:	• moisture • non-condensables • solids and acids • refrigerants or mixed refrigerants that are not specified for the refrigeration equipment
Prescribed refrigerant includes the following:	• chlorofluorocarbons (CFCs) • hydrochlorofluorocarbons (HCFCs) • hydrofluorocarbons (HFCs) • any other refrigerant prescribed by the ARC

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Refrigeration equipment includes one or more of the following:	• compressors • air/water cooled condensers, • liquid receivers • chilled water heat exchangers • evaporators • air/water cooled condensing units • associated piping and valves
Reclaim includes the following:	• to reprocess used refrigerant to a new product specification by means which may include distillation. This term usually implies the use of processes or procedures available only at a specialised reclaim or manufacturing facility
Recovery includes the following:	• removing refrigerant in any condition from a system and storing it in an external cylinder, without necessarily testing or processing it in any way
Self-contained low charge systems include the following:	• appliances which contain a fluorocarbon refrigerant charge of two kilograms or less, and do not require any work to be done on the refrigeration system at the time of installation

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18083 Handle fluorocarbon refrigerants according to regulations

Modification History

Release 1. New Unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include at least one (1) instance of application on a system other than a self-contained low charge system:

- following work instructions, standard operating procedures (SOPS) and safe work practices
- identifying and applying regulations, codes and standards relevant to handling and/or disposal of fluorocarbons in regards to:
  - removing refrigerant from a self-contained low charge system and store it in an external cylinder
  - pumping-down refrigerant from a non self-contained low charge system, including:
    - complying with code limits for receivers
    - ensuring auxiliary receivers are fitted and suitable
  - inspecting joints, seals, gaskets and flanges for traces of refrigerant oil and repairing as necessary
  - leak testing evaporator, heat exchanger, expansion valve, solenoid valve, and other components, including placing low pressure side into positive pressure before testing
  - using air purgers in negative pressure systems
  - fitting of gauge isolation valves
  - mounting compressors, including anti vibration mountings and mufflers
  - aligning shafts
  - tensioning compressor drive belts
  - evacuating a factory matched evaporator and condenser system
- identifying coding and classification for at least six:
  - chlorofluorocarbons (CFCs)
  - hydrochlorofluorocarbons (HCFCs)
  - hydrofluorocarbons (HFCs)
- identifying flammable refrigerants and taking recommended actions as per fact sheets and Flammable Refrigerants Safety Guide published by The Australian Institute of Refrigeration, Air Conditioning And Heating (AIRAH).

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE) when handling or working with refrigerants
- operating principles of refrigeration systems
- characteristics, properties and operating specifications of fluorocarbon refrigerants
- consequences of releasing quantities of ozone depleting refrigerants into the atmosphere
- ARC licensing criteria and regulations relating to handling fluorocarbon refrigerants
- methods of identifying and labelling stored refrigerants and the type of refrigerant used in a refrigeration system
- methods for recovery, storage and dispatch of fluorocarbon refrigerants to licensed reclamation facilities
- mandatory and recommended procedures in regulations, codes and standards for self-contained and non self-contained refrigeration and air conditioning systems work, including:
  - leak testing
  - charging of systems
  - recovery/pump down of refrigerants
  - evacuation
  - minimising refrigerant content of lubricant oil
  - aligning shafts
  - tensioning compressor belts
  - cleaning contaminated systems
- codes and standards for pipe joints and mountings
- safe handling and storage procedures for refrigerant cylinders
- rules and safe handling procedures for flammable refrigerants as published by AIRAH
- causes of contamination in refrigeration and air conditioning systems and their effect on refrigeration system performance
- relevant codes and regulations applying to fluorocarbon refrigeration and air conditioning systems not specifically mentioned above.

Assessment Conditions

- Assessors must:
  - have vocational competency in refrigeration system maintenance at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Assessment should be co-assessed with one or more MEM HVAC/R trade units applying to work on systems other than a self-contained low charge system

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18084 Commission and decommission split air conditioning systems

Modification History

Release 1. Supersedes and is equivalent to MEM18084A Commission and decommission split air conditioning systems

Application

This unit of competency defines the skills and knowledge required to commission and decommission single head split air conditioning systems, up to 18kW, to relevant standards, codes and local regulations.

It includes the application of safe working practices, following standard procedures to pressure test, evacuate, recover, charge and perform functional checks to test system performance.

This unit refers to plug in appliances only.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Determine the operating conditions of vapour compression systems**	2.1	Determine the actual and specified range of operating conditions from measured and calculated values using established procedures to determine as they apply to particular vapour compression systems
		2.2	Establish operating conditions and record on commissioning documentation
		2.3	Obtain tools, equipment and testing devices needed to determine the basic operating conditions and check for correct operation and safety
3	**Recover refrigerants from split air conditioning systems**	3.1	Check for, and protect site from, ignition sources if R32 or other flammable refrigerants are used
		3.2	Isolate circuits/appliances in strict accordance with work health and safety (WHS) requirements and procedures, where necessary

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Remove refrigerants safely into suitably labelled containers in accordance with legislative and industry requirements
		3.4	Deal with contaminated refrigerant in accordance with requirements
4	**Pressure and leak test split air conditioning systems**	4.1	Identify and note safety hazards and implement established risk control measures
		4.2	Follow industry codes of practice and manufacturer installation instructions
		4.3	Take precautions to prevent damage to components while pressure testing the system
		4.4	Conduct pressure testing at a pressure compatible with the refrigerant to be used
		4.5	Located leak, isolate and repair using methods appropriate to the system type under test and in accordance with industry practices
5	**Evacuate split air conditioning systems**	5.1	Note safety hazards which have not previously been identified, and implement established risk control measures
		5.2	Evacuate the system to the required level and clean the system of all moisture and other containments in accordance with requirements
		5.3	Apply a standing vacuum test in accordance with industry codes of practice and applicable standards
6	**Charge split air conditioning systems**	6.1	Select correct refrigerant for the system, in accordance with manufacturer requirements and industry practices
		6.2	Measure the refrigerant charge by weight in accordance with manufacturer specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		6.3	Charge the system in accordance with manufacturer requirements and industry practices
		6.4	Check all components and maintain in accordance with manufacturer requirements
7	**Test the operation of split air conditioning systems**	7.1	Start and operate the system
		7.2	Carry out standard tests to confirm system performance to manufacturer specifications
		7.3	Check the refrigerant charge and add refrigerant, if required
		7.4	Leak check the system
		7.5	Record test data, as required
8	**Complete the commissioning/ recommissioning of split air conditioning systems**	8.1	Ensure the worksite is cleaned and left in presentable condition in accordance with original presentation, client requirements, industry standards and organisational requirements
		8.2	Undertake final inspections to ensure installation conforms to industry, legislative and work order requirements
		8.3	Instruct the client on the use of the product in accordance with organisational requirements and manufacturer specifications
		8.4	Complete certificates of compliance and other relevant commissioning documentation and process in accordance with state/territory regulatory requirements
9	**Decommission split air conditioning systems**	9.1	Electrically disconnect plug in appliance
		9.2	Recover refrigerants, store and dispose of in accordance with legislative and industry requirements
		9.3	Remove units and components and dispose of safely and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	in accordance with regulations, industry codes of practice and sustainable environmental practices
	9.4 Clean the worksite and leave in presentable condition, to client and organisational requirements, industry standards and sustainable environmental practices
	9.5 Complete decommissioning documentation and process in accordance with state/territory regulatory requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools, equipment and testing devices include one (1) or more of the following:	• refrigeration gauge manifold • Schraeder access valves; quick connect couplings, and thermometer/thermocouple temperature measuring devices • analogue and digital vacuum measuring gauges • digital scales • refrigerant recovery unit • vacuum pump • electronic leak detectors • refrigerant containers/cylinders
Legislative and industry requirements include one (1) or more	• Commonwealth, state and territory legislation, regulations, standards and industry codes of practice • The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

of the following:	• air conditioning residential best practice guidelines (AIRAH) • AIRAH flammable refrigerants fact sheets and guide • state/territory and local building regulations • sustainable environmental practices for commissioning and decommissioning split air conditioning
System performance includes one (1) or more of the following:	• pressure • temperature • sub-cooling • superheating • evaporator coil to air temperature difference

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18084A Commission and decommission split air conditioning systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18084 Commission and decommission split air conditioning systems

Modification History

Release 1. Supersedes and is equivalent to MEM18084A Commission and decommission split air conditioning systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, legislative and industry requirements and drawings and obtaining relevant data with respect to commissioning and decommissioning split air conditioning systems
- checking system for correct operation using appropriate tools, techniques and equipment and comparing system and component performance/operation against specifications
- isolating circuit and appliances in strict accordance with work health and safety (WHS) requirements and procedures, where necessary
- identifying faulty components and non-compliances using appropriate tools, equipment and testing
- removing, containing and adding refrigerant safely in compliance with relevant Australian Standards or codes and regulations
- pressure and leak testing split air conditioning systems at a pressure compatible with the refrigerant to be used and locating leaks, isolating and applying appropriate repairs, adjustments or remedial action to achieve specifications
- completing commissioning procedures, including undertaking final inspection, instructing the client and completing certificates of compliance and other relevant commissioning documentation and processes
- decommissioning split air conditioning – single head systems using sustainable environmental practices
- completing all relevant commissioning and decommissioning documentation in accordance with state/territory regulatory requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- applicable legislative and regulatory requirements, standards, codes, licensing requirements and sustainable environmental practices for commissioning and decommissioning systems
- applicable procedures and legislative requirements for storage, handling and treatment of ozone depleting and synthetic greenhouse gas refrigerant
- applicable procedures for working with R32 and other flammable refrigerants where used in split air conditioning systems
- typical work environments, demands and considerations
- specifications, operational characteristics and process for identifying system components
- typical problems, contingencies and solutions
- applicable tools, equipment and testing devices and their operation
- procedures for determining the actual and specified range of operating conditions from measured and calculated values as they apply to particular vapour compression systems
- procedures for evacuating system, leak testing, adding refrigerant and checking air flow
- requirements and procedures to isolate circuits/appliances
- measuring instruments/equipment, specifications and procedures for checking temperature, system performance and components
- process for identifying refrigerant type
- types of commissioning documentation
- requirements and procedures for reporting non-compliances completing documentation.

Assessment Conditions

- Assessors must:
  - have vocational competency in commissioning and decommissioning split air conditioning systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

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MEM18085 Install, service and repair domestic air conditioning and refrigeration appliances

Modification History

Release 1. Supersedes and is equivalent to MEM18085A Install, service and repair domestic air conditioning and refrigeration appliances

Application

This unit of competency defines the skills and knowledge required to install, service and repair domestic air conditioning and refrigeration appliances to relevant standards, codes and local regulations and is limited to domestic air conditioning and refrigeration systems only.

It includes the application of safe working practices, following standard procedures to perform functional checks, test system performance and carry out straightforward maintenance.

This unit refers to plug-in appliances only.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Install and remove domestic refrigeration and air conditioning appliances**	2.1	Identify appliance location and site in accordance with customer requirements, regulations, standards, codes of practice and industry guidelines
		2.2	Prepare site and install and secure appliance in accordance with manufacturer instructions and industry best practice
		2.3	Check operation of the appliance in accordance with manufacturer instructions
		2.4	Dispose of waste materials and products in accordance with Commonwealth and state/territory legislation, environmental and industry codes of practice

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Determine operating condition of appliances**	3.1	Identify refrigerant used in equipment and protect from ignition sources if refrigerant is flammable
		3.2	Carry out established procedures and standard electrical tests to determine actual operating condition
		3.3	Follow established work health and safety (WHS) risk control measures and procedures to enable the system to be isolated and checked, where necessary
		3.4	Determine the basic refrigeration operating conditions and check for correct operation and safety using appropriate tools, equipment and testing devices
		3.5	Follow industry codes of practice and manufacturer service instructions
4	**Carry out routine maintenance**	4.1	Identify safety hazards and record and implement established risk control measures
		4.2	Perform routine maintenance procedure in accordance with manufacturer and client scheduling
		4.3	Maintain routine maintenance records and record faults
5	**Fault find and troubleshoot faults**	5.1	Select equipment and testing devices needed to determine fault
		5.2	Apply standard test procedures to determine faults against equipment specifications
		5.3	Record test data and record faults, as required
6	**Replace, repair or service faulty components**	6.1	Disconnect plug in appliance electrically
		6.2	Replace electrical components in accordance with manufacturer recommendations
		6.3	Select and prepare refrigeration system replacement

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			components
		6.4	Recover refrigerant, store and dispose of in accordance with Commonwealth and state/territory legislation and industry codes of practice
		6.5	Install refrigeration system components in accordance with industry best practice, standards and codes
7	**Return to service domestic refrigeration and air conditioning appliances**	7.1	Identify standard electrical tests to identify electrical faults before operating
		7.2	Start appliance and operate in accordance with manufacturer standards
		7.3	Carry out standard tests to confirm system performance to manufacturer specifications
		7.4	Record appliance operating data, as required
		7.5	Ensure worksite is cleaned and left in presentable condition in accordance with original presentation, client requirements, industry standards and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine maintenance includes the following:	• electrical testing of the appliance • polarity testing • cleaning condensers • clearing drains • checking temperatures • pressures • component operation • air flow and system capacity • cleaning filters
Standard electrical tests include:	• earth continuity, insulation resistance, and circuit resistance to meet electrical equipment regulations and codes (AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) • testing of supply voltage and the appliance or individual component current draw
Tools, equipment and testing devices include one (1) or more of the following:	• refrigeration gauge manifold • Schraeder access valves; quick connect couplings, thermometer/thermocouple temperature measuring devices • analog and digital vacuum measuring gauges • digital scales • refrigerant recovery unit • vacuum pump • electronic leak detectors • refrigerant containers/cylinders
Industry best practice includes:	• pipe fabrication techniques and industry best practice for pipe brazing
Standard refrigeration return to service procedures include one (1) or more of the following:	• leak detection • evacuation • refrigerant charging of domestic air conditioning and refrigeration plug-in appliances

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Commonwealth, state and territory legislation, regulations, standards, codes of practice and industry guidelines include one (1) or more of the following:	• Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 • air conditioning residential best practice guidelines (AIRAH) • AIRAH flammable refrigerant fact sheets and guide • state/territory and local building regulations • codes of practice for domestic refrigeration and air conditioning. (HB40)
System performance includes one (1) or more of the following:	• pressure • temperature • sub-cooling • superheating • evaporator coil to air temperature difference

Domestic refrigeration and air conditioning appliances include:	• self-contained plug in appliances primarily designed for domestic and residential situations, including one or more of the following:
	  • refrigerators - single door, two door and two door side by side
	  • freezers - chest and vertical door using, for example, refrigeration systems with cyclic defrost, frost-free with electric and hot-gas defrost, and manual defrost
	  • air conditioners (window and wall mounted self-contained room air conditioners)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18085A Install, service and repair domestic air conditioning and refrigeration appliances

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18085 Install, service and repair domestic air conditioning and refrigeration appliances

Modification History

Release 1. Supersedes and is equivalent to MEM18085A Install, service and repair domestic air conditioning and refrigeration appliances

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications and legislative and industry requirements and guidelines and obtaining relevant data with respect to servicing and repairing domestic air conditioning and refrigeration appliances
- installing and removing domestic refrigeration and air conditioning appliances in accordance with customer requirements, regulations, standards, codes of practice and industry guidelines
- isolating circuit and appliances in strict accordance with work health and safety (WHS) requirements and procedures, where necessary
- checking operating condition of refrigeration and air conditioning appliances using appropriate tools, techniques and equipment and comparing system and component performance/operation against specifications
- carrying out routine maintenance of refrigeration and air conditioning appliances
- identifying faulty components and non-compliances using appropriate tools, equipment and testing devices
- replacing, repairing or servicing faulty components in accordance with specifications and industry best practice
- removing, containing and adding refrigerant safely in compliance with relevant Australian Standards or codes and regulations
- carrying out standard electrical tests in accordance with specifications
- completing all relevant standard, code or local required documentation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures and industry best practice for brazing refrigeration pipework

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- procedures for complying to all legislative and regulatory requirements for safely removing the refrigerant and charging and evacuating the system
- procedures for evacuating system, pressure and leak testing, handling and adding refrigerant and checking air flow
- safety and legislative requirements for handling refrigerants
- standard electrical measurements for earth continuity, insulation resistance, circuit resistance, supply voltage and current
- measuring instruments/equipment, specifications and procedures for checking temperature, system performance and testing components
- specifications, operational characteristics and process for identifying system components
- process for identifying refrigerant type
- requirements and procedures for reporting non-compliances completing documentation.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing, servicing and repairing domestic air conditioning and refrigeration appliances at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18086 Test, recover, evacuate and charge refrigeration systems

Modification History

Release 1. Supersedes and is equivalent to MEM18086B Test, recover, evacuate and charge refrigeration systems

Application

This unit of competency defines the skills and knowledge required to test, recover, evacuate and charge refrigeration systems to achieve performance specification.

It applies to refrigeration systems associated with refrigeration and air conditioning in commercial, industrial, domestic, marine and transport applications. This unit does not apply to vehicle in-cab air conditioning systems.

Demonstration of competency must be in accordance with Australian Standards, including AS - HB40 Refrigeration and Air Conditioning codes of practice, and relevant ozone and greenhouse substance legislation.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055 Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess refrigeration system operation**	2.1	Apply refrigeration system operating principles and terminology to assessment of system operation
		2.2	Access and interpret all relevant information to commencement of work on the refrigeration system
		2.3	Undertake checks on the refrigeration system, including appropriate basic electrical safety checks in accordance with relevant codes and regulations
		2.4	Develop appropriate operating procedures, as required
		2.5	Determine and record pressures and temperatures
		2.6	Isolate faults to component level and determine appropriate corrective action
		2.7	Check the refrigeration system for leaks and any contamination

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Recover refrigerant and evacuate system**	3.1	Recover and contain refrigerant used in the system in accordance with codes and regulations
		3.2	Evacuate the refrigeration system in accordance with codes and regulations
4	**Charge the refrigeration system**	4.1	Charge the refrigeration system with the correct refrigerant
		4.2	Add appropriate lubricating oil to the refrigeration system
		4.3	Check the refrigeration system for leaks

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Relevant information includes one (1) or more of the following:	• manufacturers' technical data • pressure temperature charts • operating manuals
Appropriate corrective action includes:	• isolation and tagging of faulty components, repair and/or replacement
Contamination includes	• moisture

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• non-condensables • solids and acids
Refrigerant includes one (1) or more of the following:	• chlorofluorocarbons (CFCs) • hydrochlorofluorocarbons (HCFCs) • hydrofluorocarbons (HFCs) • natural refrigerants • ammonia
Relevant codes and regulations include:	• Australian Standards, refrigeration and air conditioning codes of practice, relevant ozone and greenhouse substance legislation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18086B Test, recover, evacuate and charge refrigeration systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18086 Test, recover, evacuate and charge refrigeration systems

Modification History

Release 1. Supersedes and is equivalent to MEM18086B Test, recover, evacuate and charge refrigeration systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting drawings, instructions, specifications, procedures, codes and regulations to test and check refrigeration components and systems
- planning and sequencing refrigeration operations and developing operating procedures for equipment as required in compliance with AS - HB40 Refrigeration and Air Conditioning codes of practice and ozone and greenhouse substance legislation
- performing electrical safety checks and tests for conformance to specifications using appropriate techniques and equipment, determining pressures and temperatures and documenting test results and procedures undertaken
- identifying faulty components and any system contamination and selecting appropriate materials, equipment and refrigerant to recover, evacuate and charge the system
- lubricating and checking the re-charged refrigeration system for leaks and rectifying, where required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE) when handling or working with refrigerants
- operating principles of refrigeration systems
- characteristics, properties and operating specifications of all types of refrigerant
- methods of identifying stored refrigerants and the type of refrigerant used in a refrigeration system
- relevant codes and regulations applying to refrigeration systems
- procedures and safety precautions for testing/checking refrigeration systems
- corrective actions for system and component faults, including appropriate basic electrical safety checks
- types of refrigerant leak detection equipment/techniques and their applications

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- causes of contamination in refrigeration systems and their effect on refrigeration system performance
- procedures for cleaning contaminated systems, tools and equipment used
- care and use of vacuum pumps
- tools, techniques and equipment required to carry out refrigerant recovery procedures
- procedures for charging refrigeration systems and the correct refrigerant for a range of given applications and tools, techniques and equipment to be used
- safety precautions to be taken when charging refrigeration systems with refrigerant by various methods
- procedures for storing and disposing of recovered refrigerant and consequences of releasing quantities of refrigerant into the atmosphere
- properties and uses of refrigeration oil and the procedures to be followed when checking level and adding lubricating oil.

Assessment Conditions

- Assessors must:
  - have vocational competency in testing, recovering, evacuating and charging refrigeration systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18087 Service and repair domestic and light commercial refrigeration and air conditioning equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18087B Service and repair domestic and light commercial refrigeration and air conditioning equipment

Application

This unit of competency defines the skills and knowledge required to service domestic and light commercial refrigeration and air conditioning equipment and components.

It applies to retrofitting existing domestic and light commercial refrigeration and air conditioning equipment with alternative refrigerants; reconditioning components; returning to service; testing equipment; and completing service reports for administrative action.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks/ adjustments**	2.1	Carry out visual inspection and testing with appropriate test equipment according to refrigeration/air conditioning principles, procedures and safety requirements
		2.2	Perform preventative maintenance tasks according to manufacturers' specifications using refrigeration/air conditioning techniques/practices
3	**Undertake fault-finding**	3.1	Identify equipment components
		3.2	Interpret the characteristics and operation of each component
		3.3	Inspect and test the operational function of each component and assess correct operation against specification

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Repair/replace faulty components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant from the system safely and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair/replace to manufacturers' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service refrigeration/ air conditioning equipment**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Verify correct operation of the equipment
		5.3	Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• service manifolds • pressure gauges • vacuum gauges • multimeter • ampmeter

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- insulation resistance tester
- vacuum pump

Preventative maintenance tasks include one (1) or more of the following:

- check/adjust fan belts
- check/clean filters
- check/clean heat exchangers (evaporator and condenser)
- overhaul of major system components
- cleaning of major system components
- testing operation of all control and safety devices
- testing refrigeration charge
- testing operational current
- testing insulation resistance of relevant electrical components

Governing and guidance documentation includes the following:

- noise and environmental regulations
- applicable Commonwealth, state and territory regulations and legislation
- air conditioning residential best practice guidelines (AIRAH)
- AIRAH flammable refrigerant fact sheets and guide

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18087B Service and repair domestic and light commercial refrigeration and air conditioning equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18087 Service and repair domestic and light commercial refrigeration and air conditioning equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18087B Service and repair domestic and light commercial refrigeration and air conditioning equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation and regulations with respect to servicing and repairing domestic and light commercial refrigeration and air conditioning equipment
- checking system components for correct operation using appropriate tools, techniques and test equipment and comparing system and assessing component performance/operation against specifications
- carrying out preventative maintenance of domestic and light commercial refrigeration and air conditioning according to manufacturers' specifications using refrigeration/air conditioning techniques/practices
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with servicing and repairing domestic and light commercial refrigeration and air conditioning
- charging the system and verifying the correct operation of the equipment to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- preventative maintenance requirements

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- procedures for protecting worksite and equipment from ignition sources if refrigerant used is flammable
- variations in component identities
- operation and characteristics of range of components
- procedures for checking refrigeration/air conditioning components for correct operation
- tools, equipment and procedures for assembling components
- tools, equipment, techniques and procedures for adjusting refrigeration/air conditioning systems for correct operation and to specification
- procedures for obtaining authorisation of adjustments outside of operational specifications
- procedures for recovery, containment and storage
- effect of poor repair practices
- processes and resources to select replacement parts
- basic electrical principles, testing and fault identification
- codes and regulations relevant to the refrigeration/air conditioning industry, including environmental and ozone and greenhouse substance legislation.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing domestic and light commercial refrigeration and air conditioning equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18088 Maintain and repair commercial air conditioning systems and components

Modification History

Release 1. Supersedes and is equivalent to MEM18088B Maintain and repair commercial air conditioning systems and components

Application

This unit of competency defines the skills and knowledge required to maintain and repair commercial air conditioning systems and components.

It applies to commercial air conditioning systems and components, including heating systems, direct expansion refrigeration systems, and/or simple air distribution systems; typically used for comfort air conditioning and also applies to retrofitting existing commercial air conditioning systems with alternative refrigerants and reconditioning components.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks/ adjustments**	2.1	Check the temperature, quality, properties and flow of air delivered by the air conditioning system for conformance to specification
		2.2	Check the noise/vibration levels of the air conditioning system components for conformance to specification
		2.3	Perform preventative maintenance tasks according to manufacturers' specifications using refrigeration and air conditioning principles and techniques
3	**Undertake fault-finding**	3.1	Identify system components
		3.2	Interpret the characteristics and operation of each component

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Inspect and test the operational function of each component and assess correct operation against specification
4	**Repair/replace faulty components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant from the system safely and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair to manufacturers' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service commercial air conditioning systems and components**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Charge the system with correct refrigerant safely and in accordance with procedures and regulatory requirements
		5.3	Verify correct operation of the equipment
		5.4	Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:

- service manifolds
- measuring instruments/equipment for checking:
  - air temperatures
  - air flows
  - air quality
  - air properties
  - noise and vibration levels
- multimeter
- ampmeter
- insulation resistance tester

Preventative maintenance tasks include one (1) or more of the following:

- check/adjust fan belts
- check/clean filters
- check/clean heat exchangers (evaporator and condenser)
- overhaul of major system components
- cleaning of major system components
- testing operation of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18088B Maintain and repair commercial air conditioning systems and components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18088 Maintain and repair commercial air conditioning systems and components

Modification History

Release 1. Supersedes and is equivalent to MEM18088B Maintain and repair commercial air conditioning systems and components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing commercial air conditioning systems and components
- selecting and using equipment to test and check temperature, flow and quality of conditioned air for conformance against specifications, legislation and regulations
- carrying out preventative maintenance according to manufacturers' specifications using refrigeration/air conditioning techniques/practices
- checking system components for correct operation using appropriate tools, techniques and test equipment and assessing component performance/operation against specifications
- identifying and localising faulty components and confirming malfunction by inspection/testing, making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements
- removing/dismantling and reassembling faulty components and selecting replace parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining and repairing commercial air conditioning systems and components
- charging the system and verifying correct operation of the equipment to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- measuring instruments/equipment and specifications for checking air temperatures, air flows, air quality and air properties

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- procedures for performing preventative maintenance on air conditioning systems and sequence of implementation
- techniques and procedures for inspecting, testing and assessing system components and operational compliance to meet specifications
- procedures for safely removing the refrigerant from the system and charging the system and all legislative and regulatory requirements
- tools, equipment, techniques and procedures for dismantling and repairing faulty components, reassembling and testing components
- air properties controlled by the air conditioning system
- measuring instruments/equipment and specifications required for checking component noise and vibration levels
- specifications and process for identifying system components
- operational characteristics of the system components
- appropriate process for localising and confirming faulty components
- selecting and using equipment for testing electrical compliance of equipment
- procedures for completing maintenance records/service reports and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing commercial air conditioning systems and components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18089 Maintain and repair central air handling systems

Modification History

Release 1. Supersedes and is equivalent to MEM18089B Maintain and repair central air handling systems

Application

This unit of competency defines the skills and knowledge required to maintain and repair large central air handling systems.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.

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MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks/adjustments**	2.1	Check the temperature, humidity, quality, pressure and flow of air delivered to zones by the air handling system for conformance to specification
		2.2	Check the noise/vibration levels of the air handling sub-systems for conformance to specification
		2.3	Perform preventative maintenance tasks according to manufacturers' specifications using appropriate refrigeration and air conditioning techniques/practices
3	**Undertake fault finding on large central air handling systems**	3.1	Identify components of sub-systems
		3.2	Interpret the characteristics and operation of each sub-system component
		3.3	Inspect and test the operational function of each sub-system component and assess correct operation

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	against specification
4 **Repair/replace faulty air handling components**	4.1 Localise faulty components and confirm malfunction
	4.2 Dismantle faulty components and repair to manufacturers' specifications, as required
	4.3 Select replacement parts from manufacturers' catalogues
5 **Return to service large central air handling systems**	5.1 Reassemble components and test for correct operation and assess against specification
	5.2 Verify correct operation of the equipment
	5.3 Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Air handling systems include two (2) or more of the following:	• boilers • chillers • secondary refrigeration pumps • dehumidifiers • odour control • complex filtering systems

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- multi-zone distribution systems

Test equipment includes one (1) or more of the following:

- measuring instruments/equipment for checking:
  - air temperatures
  - humidity
  - air flows
  - air quality
  - air pressure
  - noise and vibration levels
- multimeter
- ampmeter
- insulation resistance tester

Preventative maintenance tasks include one (1) or more of the following:

- check/adjust fan belts
- check/clean filters
- check/clean heat exchangers (evaporator and condenser)
- overhaul of major system components
- cleaning of major system components
- testing operation of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18089B Maintain and repair central air handling systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18089 Maintain and repair central air handling systems

Modification History

Release 1. Supersedes and is equivalent to MEM18089B Maintain and repair central air handling systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing central air handling systems
- selecting and using appropriate tools, techniques and equipment necessary to check and assess large central air conditioning system, sub-system and components for conformance against specifications, legislation and regulations
- carrying out preventative maintenance tasks according to manufacturers' specifications using refrigeration/air conditioning techniques/practices
- identifying and localising faulty components and confirming malfunction by inspection/testing, making required adjustments to achieve specifications
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining and repairing central air handling
- verifying correct operation of the equipment to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate measuring instruments/equipment and specifications for checking humidity, air temperatures, air flows, air quality and air pressure
- tools, equipment, techniques and procedures for performing preventative maintenance on an air conditioning system and sequence of implementation
- procedures for localising and confirming faulty components
- tools, equipment, techniques and procedures for dismantling and repairing faulty components and selecting replacement parts

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- measuring instruments/equipment and specifications required for checking sub-system noise and vibration levels
- techniques and procedures for inspecting, testing and assessing each sub-system components against specifications
- specifications of, and process for, identifying primary and secondary refrigerant, or air distribution/reticulation systems
- operational characteristics of each sub-system component
- codes and regulations relevant to the refrigeration/air conditioning industry, including environmental and ozone and greenhouse substance legislation
- procedures for completing maintenance records/service reports and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing central air handling systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18090 Maintain and repair industrial refrigeration systems and components

Modification History

Release 1. Supersedes and is equivalent to MEM18090B Maintain and repair industrial refrigeration systems and components

Application

This unit of competency defines the skills and knowledge required to maintain and repair industrial refrigeration systems.

It applies to industrial refrigeration systems that include large capacity plant typically used for product/process, temperature/environment control, including retrofitting existing industrial refrigeration systems and reconditioning components.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM10010	Install pipework and pipework assemblies
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks/ adjustments**	2.1	Check the temperature and properties of the controlled medium/s for conformance to specification
		2.2	Check the noise/vibration levels of the industrial refrigeration system components for conformance to specification
		2.3	Perform preventative maintenance tasks and plant room safety equipment checks according to manufacturers'

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			specifications using refrigeration principles techniques/practices
3	**Undertake fault finding on industrial refrigeration systems and components**	3.1	Identify system components
		3.2	Interpret the characteristics and operation of each component
		3.3	Inspect and test the operational function of each component and assess correct operation against specification
4	**Repair/replace faulty industrial refrigeration components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant safely from the system and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair to manufacturers' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service industrial refrigeration systems and components**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Charge the system safely with correct refrigerant and in accordance with procedures and regulatory requirements, where appropriate
		5.3	Verify correct operation of the equipment
		5.4	Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Controlled mediums include one (1) or more of the following:

- process chilling
- secondary refrigerants, including:
  - glycol
  - brine
  - air
  - water
  - ice

Test equipment includes one (1) or more of the following:

- measuring instruments/equipment for checking:
  - temperatures
  - properties
  - noise and vibration levels
- multimeter
- ampmeter
- insulation resistance tester

Preventative maintenance tasks include one (1) or more of the following:

- check/adjust fan belts
- check/clean filters
- check/clean heat exchangers (evaporator and condenser)
- overhaul of major system components
- cleaning of major system components
- testing operation of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18090B Maintain and repair industrial refrigeration systems and components

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Assessment Requirements for MEM18090 Maintain and repair industrial refrigeration systems and components

Modification History

Release 1. Supersedes and is equivalent to MEM18090B Maintain and repair industrial refrigeration systems and components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least two (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing industrial refrigeration systems and components
- checking the temperature and properties of controlled mediums for conformance with specifications
- carrying out preventative maintenance tasks according to manufacturers' specifications using refrigeration techniques/practices
- checking components for correct operation using appropriate tools, techniques and test equipment and assessing component performance/operation against specifications
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining and repairing industrial refrigeration systems and components
- charging the system and verifying correct operation of the equipment to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- measuring instruments/equipment, specifications and procedures for checking temperatures

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- properties of controlled mediums
- measuring instruments/equipment, specifications and procedures for checking components noise and vibration levels
- tools, equipment, techniques and procedures for performing preventative maintenance on air conditioning systems and sequence of implementation
- procedures for safely removing the refrigerant and charging the system and all legislative and regulatory requirements
- tools, equipment, techniques and procedures for dismantling, repairing, reassembling and testing components
- specifications, operational characteristics and process for identifying system components
- process for localising and confirming faulty components
- procedures for completing maintenance records/service reports and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing industrial refrigeration systems and components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18091 Maintain and repair multistage, cascade and/or ultra-cold industrial refrigeration systems

Modification History

Release 1. Supersedes and is equivalent to MEM18091B Maintain and repair multi stage, cascade and/or ultra-cold industrial refrigeration systems

Application

This unit of competency defines the skills and knowledge required to maintain and repair multistage, cascade and ultra-cold industrial refrigeration systems.

It applies to retrofitting existing multi-stage, cascade and/or ultra-cold industrial refrigeration systems; reconditioning components; returning to service and testing systems; and completing service reports for administrative action.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Plus, one or more of the following including prerequisites:

MEM18087	Service and repair domestic and light commercial refrigeration and air conditioning equipment
MEM18088	Maintain and repair commercial air conditioning systems and components
MEM18090	Maintain and repair industrial refrigeration systems and components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive**	2.1	Check the temperature, pressure and properties of the system for conformance to specification

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	maintenance checks/ adjustments	2.2	Check the noise/vibration levels of the system for conformance to specification
		2.3	Perform preventative maintenance tasks according to manufacturers' specifications using refrigeration techniques/practices
3	**Undertake fault-finding**	3.1	Identify system components
		3.2	Interpret the characteristics and operation of each component
		3.3	Inspect and test the operational function of each component and assess correct operation against specification
4	**Repair/replace faulty components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant safely from the system and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair to manufacturers' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service multistage, cascade and/or ultra-cold refrigeration systems**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Charge the system safely with correct refrigerant and in accordance with procedures and regulatory requirements, where appropriate
		5.3	Verify correct operation of the equipment
		5.4	Complete maintenance records/service reports according to SOPs and legislative requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• measuring instruments/equipment for checking:
	  • temperatures
	  • pressures
	  • properties
	  • noise and vibration levels
	• multimeter
	• ampmeter
	• insulation resistance tester

Preventative maintenance tasks include one (1) or more of the following:	• check/adjust fan belts • check/clean filters • check/clean heat exchangers (evaporator and condenser) • overhaul of major system components • cleaning of major system components • testing operation of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18091B Maintain and repair multi stage, cascade and/or ultra-cold industrial refrigeration systems

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18091 Maintain and repair multistage, cascade and/or ultra-cold industrial refrigeration systems

Modification History

Release 1. Supersedes and is equivalent to MEM18091B Maintain and repair multi stage, cascade and/or ultra-cold industrial refrigeration systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least two (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing multi-stage, cascade and/or ultra-cold industrial refrigeration systems
- checking the temperature, pressure, properties, noise and vibration levels for conformance with specifications
- carrying out preventative maintenance tasks according to manufacturers' specifications using refrigeration techniques/practices
- checking components for correct operation using appropriate tools, techniques and test equipment and assessing component performance/operation against specifications
- identifying and localising faulty components and confirming malfunction by inspection/testing, making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining and repairing industrial refrigeration systems
- charging the system and verifying correct operation of the equipment to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- measuring instruments/equipment and specifications for checking the temperature/s and properties of the controlled medium/s
- tools, equipment, techniques and procedures for performing preventative maintenance and sequence of implementation
- procedures for performing safety equipment checks and sequence of implementation
- tools, equipment, techniques and procedures for dismantling, repairing, reassembling and testing components
- procedures for safely removing the refrigerant from the system and all legislative and regulatory requirements
- measuring instruments/equipment and specifications for checking component noise and vibration levels
- specifications and processes for identifying system components
- operational characteristics of the system components
- procedures for completing maintenance records/service reports and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing multi-stage, cascade and/or ultra-cold industrial refrigeration systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18092 Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls

Modification History

Release 1. Supersedes and is equivalent to MEM18092B Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls

Application

This unit of competency defines the skills and knowledge required to repair or replace commercial and/or industrial refrigeration and/or commercial air conditioning controls.

This unit applies to the installation, adjustment, repairs, replacements and overhauls undertaken to site or manufacturers' specifications, using application of principles of domestic refrigeration and/or commercial air conditioning control sequencing.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: B

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Plus, one or more of the following, including their prerequisites:

MEM18088	Maintain and repair commercial air conditioning systems and components
MEM18090	Maintain and repair industrial refrigeration systems and components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Install/replace refrigeration/air conditioning controls**	2.1	Identify control circuit components and inspect for compliance to specification
		2.2	Undertake sequential installation according to manufacturers' specifications and procedures
3	**Check and adjust refrigeration/air**	3.1	Check the temperature, quality, pressure and properties of the air delivered by the air conditioning system for

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	conditioning control sequence and operation		conformance to specification
		3.2	Check controls operation against operational specifications using appropriate test equipment and application principles/techniques
		3.3	Perform adjustments to control sequence to meet/align to operational requirements and specifications
		3.4	Record modifications/alterations and report according to SOPs
		3.5	Check controls operation and return to service to specification
4	**Fault find refrigeration/air conditioning control circuits**	4.1	Identify and inspect control circuit components
		4.2	Trace control circuit and diagnose action of components to identify and localise faults
		4.3	Test control circuit parts using appropriate test equipment and application principles
		4.4	Assess control circuit parts against operational specification
		4.5	Localise fault condition at the component level, evaluate faulty condition, analyse root cause and plan corrective action
5	**Maintain, repair/replace control components**	5.1	Apply correct maintenance procedures according to procedures
		5.2	Use appropriate tools, equipment and techniques to test faulty items and repair or replace using sequential installation procedures according to manufacturers' specifications
		5.3	Select replacement items from manufacturers' catalogues
		5.4	Reassemble control components according to specification

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

6	**Check and adjust sequence of refrigeration/air conditioning controls**	6.1	Identify sensors and controllers
		6.2	Make necessary adjustments to sequence control circuit and check correct operation to meet operational specification
		6.3	Return refrigeration/air conditioning controls to service to specification
		6.4	Adopt appropriate follow-up procedures
		6.5	Complete service/maintenance report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control sequencing includes one (1) or more of the following:	• programmable logic controllers (PLCs) • relay logic control systems • unitised/modular sensors • transducers • timers • counters • associated equipment
Test equipment includes	• pressure gauges

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

one (1) or more of the following:	• multimeters • ampmeters • insulation resistance tester • cable analyser
Modifications/alterations include (1) one or more of the following:	• pressure control settings • timer settings • thermostat settings
Corrective action includes one (1) or more of the following:	• replacement • repair • adjustment
Maintenance procedures include the following:	• overhaul of major system components • cleaning of major system components • testing operation of all control and safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18092B Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18092 Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls

Modification History

Release 1. Supersedes and is equivalent to MEM18092B Maintain and repair commercial and/or industrial refrigeration and/or air conditioning controls

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least two (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing commercial and/or industrial and/or air conditioning controls
- selecting and using appropriate tools, techniques and equipment necessary to check commercial and/or industrial and/or air conditioning controls for conformance against specifications
- checking and performing adjustments to control sequence using appropriate test equipment meeting/aligning to operational requirements and specifications
- recording any modifications complying with manufacturers' specifications and making all changes to on-site drawings/documents and documenting in accordance with SOPs
- testing and assessing control circuit parts using appropriate test equipment and application principles against operational specifications
- performing maintenance procedures, including overhauling and cleaning of major system components, and testing of all control and safety devices to specifications
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- undertaking calculations and numerical operations associated with maintaining and repairing commercial and/or industrial and/or air conditioning controls
- removing/dismantling and reassembling faulty control components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- checking and adjusting sequence control circuit to meet operational specifications and confirming correct operation
- returning refrigeration/air conditioning controls to service and adopting appropriate follow-up procedures
- completing all service/maintenance reports in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- refrigeration/air conditioning system operational requirements and specifications
- application of common system/circuit components and controllers
- importance of following installation procedures in terms of control operation, safety and reliability
- measuring instruments/equipment and specifications for checking air temperatures, air flows, air quality and air properties
- tools, equipment, techniques and procedures for rectifying faulty conditions and components
- procedures for returning to service and commissioning refrigeration/air conditioning control systems
- operational sequence of the system
- typical adjustments to correct sequencing variations from specification
- typical causes of component failure
- maintenance requirements
- codes and regulations relevant to the refrigeration/air conditioning industry, including environmental and ozone and greenhouse substance legislation
- procedures for reporting/recording modifications/alterations maintenance and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing commercial and/or industrial refrigeration and/or air conditioning controls at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18093 Maintain and repair integrated industrial refrigeration and/or large air handling system controls

Modification History

Release 1. Supersedes and is equivalent to MEM18093B Maintain and repair integrated industrial refrigeration and/or large handling system controls

Application

This unit of competency covers the skills and knowledge required for repairing/replacing integrated industrial refrigeration and/or air handling system controls.

This unit applies to installation, adjustment, repairs, replacements and overhauls undertaken to site or manufacturers' specifications, using application of principles of industrial refrigeration and/or air handling systems control sequencing.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Plus, one or more of the following including their prerequisites

MEM18090	Maintain and repair industrial refrigeration systems and components
MEM18089	Maintain and repair central air handling systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Install/replace refrigeration/air handling system controls**	2.1	Identify control system/circuit components and inspect for compliance to specifications
		2.2	Undertake sequential installation according to manufacturers' specifications and procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Check and adjust refrigeration/air handling system control sequence and operation**	3.1	Check the temperature, quality, pressure and properties of the air delivered by the air handling system for conformance to specification
		3.2	Check controls and system operation against operational specifications using appropriate test equipment and application of principles/techniques
		3.3	Perform adjustments to sequence system to meet/align to operational requirements and specifications
		3.4	Record modifications/alterations and report according to SOPs
		3.5	Check controls and system operation and commission to specifications
4	**Fault find refrigeration/air handling system control circuits**	4.1	Identify and inspect control system/circuit components
		4.2	Trace control system/circuit and diagnose action of components to identify and localise faults
		4.3	Test control system/circuit parts using appropriate test equipment and application principles
		4.4	Assess control system/circuit parts against operational specification
		4.5	Localise fault condition at the component level, evaluate faulty condition, analyse root cause and plan corrective action
5	**Maintain, repair/replace system control components**	5.1	Apply correct maintenance procedures according to procedures
		5.2	Use appropriate tools, equipment and techniques to test faulty items, repair or replace using sequential installation procedures according to manufacturers' specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	5.3	Select replacement items from manufacturers' catalogues
	5.4	Reassemble system control components to specification
6 **Check and adjust sequence of refrigeration/air handling system controls**	6.1	Identify circuit sensors and controllers
	6.2	Make necessary adjustments to sequence system control circuit and check correct operation to meet operational specification
	6.3	Commission refrigeration/air handling system controls to specification
	6.4	Adopt appropriate follow-up procedures
	6.5	Complete service/maintenance report in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Control sequencing includes one (1) or more of the following:	• programmable logic controllers (PLCs) • relay logic control systems • unitised/modular sensors • transducers • timers • counters • associated equipment
Test equipment includes one (1) or more of the following:	• pressure gauges • multimeters • ampmeters • insulation resistance tester • cable analyser
Modifications/alterations include one (1) or more of the following:	• pressure control settings • timer settings • thermostat settings Must comply with manufacturers' specifications, and all changes in site drawings/documents should be documented
Corrective action includes one (1) or more of the following:	• replacement • repair • adjustment
Maintenance procedures include the following:	• testing of all control sequences • testing of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18093B Maintain and repair integrated industrial refrigeration and/or large handling system controls

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Links

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Assessment Requirements for MEM18093 Maintain and repair integrated industrial refrigeration and/or large air handling system controls

Modification History

Release 1. Supersedes and is equivalent to MEM18093B Maintain and repair integrated industrial refrigeration and/or large handling system controls

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions, on at least two (2) systems, and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing integrated industrial refrigeration and/or large air handling system controls
- selecting and using appropriate tools, techniques and equipment necessary to check integrated industrial refrigeration and/or large air handling system controls for conformance against specifications
- checking and performing adjustments to control sequence using appropriate test equipment meeting/aligning to operational requirements and specifications
- recording any modifications complying with manufacturers' specifications and making all changes in site drawings/documents and documenting in accordance with SOPs
- testing and assessing control system/circuit parts using appropriate test equipment and application principles against operational specifications
- performing maintenance procedures, including testing of all control sequences and safety devices to specifications
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- undertaking calculations and numerical operations associated with maintaining and repairing integrated industrial refrigeration and/or large air handling system controls
- removing/dismantling and reassembling faulty system control components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- checking and adjusting sequence system control circuit to meet operational specifications and confirming correct operation
- commissioning refrigeration/air handling system controls to service and adopting appropriate follow-up procedures
- completing all service/maintenance reports in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- system operational requirements and specifications
- application of common refrigeration/air handling system components and controllers
- importance of following installation procedures in terms of control operation, safety and reliability
- measuring instruments/equipment and specifications for checking air temperatures, air flows, air quality and air properties
- tools, equipment, techniques and procedures for rectifying faulty conditions
- procedures for returning to service or commissioning refrigeration/air handling control systems
- refrigeration/air conditioning test equipment and application
- operational sequence of systems
- typical adjustments to correct sequencing variations from specification
- typical causes of component failure
- maintenance schedule and procedures
- common adjustments that can be made to control systems and their effect
- maintenance/service recording/reporting requirements
- procedures for reporting/recording modifications/alterations maintenance and reporting non-conformances.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing integrated industrial refrigeration and/or large handling system controls at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18094 Service and repair commercial refrigeration

Modification History

Release 1. Supersedes and is equivalent to MEM18094B Service and repair commercial refrigeration

Application

This unit of competency defines the skills and knowledge required to service and repair commercial and supermarket equipment and components.

It applies to supermarket, retail, wholesale and other commercial applications and can include retrofitting alternative refrigerants in existing equipment.

Where the removal and replacement of components by brazing and/or silver soldering is required unit MEM05006 Perform brazing and/or silver soldering should also be selected.

Where detailed maintenance on control systems is required unit MEM18057 Maintain/service analog/digital electronic equipment should also be selected.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM10002	Terminate and connect electrical wiring
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18049	Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c.
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks/adjustments**	2.1	Carry out visual inspection and testing with appropriate test equipment according to refrigeration principles, procedures and safety requirements
		2.2	Perform preventative maintenance tasks according to manufacturers' specifications
3	**Undertake fault**	3.1	Identify equipment components

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	finding on commercial refrigeration equipment	3.2	Interpret the characteristics and operation of each component
		3.3	Inspect and test the operational function of each component and assess correct operation against specifications
4	**Repair/replace commercial refrigeration components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant safely from the system and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair to manufacturers' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service commercial refrigeration equipment**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Charge the system safely with correct refrigerant and in accordance with procedures and regulatory requirements, where appropriate
		5.3	Verify correct operation of the equipment
		5.4	Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one (1) or more of the following:	• multimeter • ammeter • insulation resistance tester • refrigeration gauge set • vacuum pump • service gauges • thermometer
Preventative maintenance tasks include one (1) or more of the following:	• overhaul of major system components • cleaning of major system components • test operation of all safety devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18094B Service and repair commercial refrigeration

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18094 Service and repair commercial refrigeration

Modification History

Release 1. Supersedes and is equivalent to MEM18094B Service and repair commercial refrigeration

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to servicing and repairing commercial refrigeration
- selecting and using appropriate tools, techniques and test equipment necessary to check and assess commercial and supermarket equipment and components for conformance with specifications
- carrying out preventative maintenance tasks according to manufacturers' specifications using refrigeration techniques/practices
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements, where required
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with servicing and repairing commercial refrigeration
- charging the system and verifying correct operation of the equipment to meet specifications, where required
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- frequency and reason for preventative maintenance
- variations in component identities
- operation and characteristics of range of components

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- procedures for refrigeration systems evacuation, recovery containment and storage for refrigerants
- tools, techniques, equipment and procedures necessary to check and test refrigeration system components
- tools, techniques, equipment and procedures for adjusting refrigeration systems
- procedures for obtaining authorisation of adjustments outside of operational specifications
- effect of poor repair practices
- process to select replacement parts
- codes and regulations relevant to the refrigeration/air conditioning industry, including environmental and ozone and greenhouse substance legislation.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing commercial refrigeration at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18095 Maintain and repair cooling towers/evaporative condensers and associated equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18095A Maintain and repair cooling towers/evaporative condensers and associated equipment

Application

This unit of competency defines the skills and knowledge required to perform maintenance procedures and/or repairs on cooling towers or evaporative condensers, associated equipment and controls to ensure performance to relevant Australian Standards, regulations and codes.

Cooling towers and evaporative condensers form an integral part of the refrigeration system in commercial, industrial and air conditioning fields. The towers, condensers, centrifugal water pumps, fans, valves and controls comprise the maintenance/repair work skills relevant to this field and must be assessed in this context.

Where the refitting or repair/replacement of components involves the fabrication and installation of pipework and assemblies then unit MEM10010 Install pipework and pipework assemblies should also be selected.

Where water treatment only is required then unit MEM13007 Maintain water treatment systems for cooling towers should be selected.

Where rectification, modification involving electrical disconnection and reconnection is required unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c. should also be selected.

There is legislation, regulation and codes of practice for cooling towers in each jurisdiction. Relevant material should be referenced.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering

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MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12002	Perform electrical/electronic measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Plus, one or more of the following including their prerequisites:

MEM18088	Maintain and repair commercial air conditioning systems and components
MEM18094	Service and repair commercial refrigeration

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Undertake preventive maintenance checks**	2.1	Carry out visual inspection and testing with appropriate test equipment according to refrigeration principles, procedures and safety requirements
		2.2	Perform preventative maintenance tasks to manufacturers' specifications
3	**Undertake fault-finding on cooling tower/evaporative condenser water systems components**	3.1	Identify system components
		3.2	Interpret the characteristics and operation of each component
		3.3	Inspect and test the operational function of each component and assess correct operation against specifications
4	**Repair/replace cooling tower/evaporative condenser components**	4.1	Localise faulty components and confirm malfunction
		4.2	Remove the refrigerant safely from the system and contain in accordance with procedures and regulatory requirements, where appropriate
		4.3	Dismantle faulty components and repair to manufactures' specifications, as required
		4.4	Select replacement parts from manufacturers' catalogues
5	**Return to service cooling tower/evaporative condenser components**	5.1	Reassemble components and test for correct operation and assess against specification
		5.2	Charge the system safely with correct refrigerant and in accordance with procedures and regulatory requirements, where appropriate

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.3 Verify correct operation of the equipment
	5.4 Complete maintenance records/service reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• fan motor • fan blade • pump • pump motor • sprays • condenser • valves (bypass, shut-off and temperature control valves) • thermostat • drift eliminators • V belt • water strainer
Test equipment includes one (1) or more of the following:	• sling psychrometer • thermometer • refrigeration gauges • vacuum pump • leak detector

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- multimeter
- insulation resistance tester

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18095A Maintain and repair cooling towers/evaporative condensers and associated equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18095 Maintain and repair cooling towers/evaporative condensers and associated equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18095A Maintain and repair cooling towers/evaporative condensers and associated equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications, drawings and relevant legislation with respect to maintaining and repairing cooling towers/evaporative condensers and associated equipment
- selecting and using appropriate tools, techniques and test equipment necessary to check and assess components for correct operation and conformance against specifications
- carrying out preventative maintenance according to manufacturers' specifications using refrigeration techniques/practices
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements, where required
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining and repairing cooling towers/evaporative condensers and associated equipment
- charging the system and verifying correct operation of the equipment to meet specifications, where required
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- terminology of cooling towers
- psychrometrics
- measuring instruments/equipment, specifications and procedures for checking temperature/humidity/air flow

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- operation of centrifugal water pumps
- terminology of centrifugal water pumps
- field testing centrifugal pumps
- operation of water valves including bypass valve either mechanical or electrical operation
- procedures for testing of fan motors and operation of controls
- tools, techniques, equipment and procedures for performing preventative maintenance on cooling towers/evaporative condensers and sequence of implementation
- procedures for safely removing the refrigerant and charging the system, including all legislative and regulatory requirements
- tools, techniques, test equipment and procedures for dismantling, repairing, reassembling and testing components
- V belts
- measuring instruments/equipment, specifications and procedures for checking component noise and vibration levels
- process to select replacement parts
- specifications, operational characteristics and process for identifying system components
- process for localising and confirming faulty components
- procedures for reporting non-conformances and completing maintenance records/service reports.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and repairing cooling towers/evaporative condensers and associated equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18096 Maintain, repair/replace and adjust refrigerant flow controls and associated equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18096A Maintain, repair/replace and adjust refrigerant flow controls and associated equipment

Application

This unit of competency defines the skills and knowledge required to perform the selection, maintenance, repair/replacement and adjustment of refrigerant flow controls, either liquid or vapour (mechanical or electronic types) to achieve desired operational performance.

The associated equipment includes controllers and/or valves required to ensure proper operation of the flow device.

Where the interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where rectification, modification involving electrical disconnection and reconnection is required unit MEM18049 Disconnect/reconnect fixed wired equipment up to 1000 volts a.c./1500 volts d.c. should also be selected.

A Refrigerant Handling Licence must be held by any person who carries out work in relation to refrigeration and air conditioning equipment.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM10010	Install pipework and pipework assemblies
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements

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MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM18086	Test, recover, evacuate and charge refrigeration systems

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Undertake preventative maintenance checks on refrigerant flow controls**	2.1	Identify the location and interpret the operational parameters of the refrigerant control
		2.2	Carry out visual inspection and testing with appropriate test equipment by following refrigeration principles, procedures and safety requirements
		2.3	Identify the refrigerant type

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Undertake fault finding on refrigerant flow controls**	3.1	Identify and interpret flow control and its characteristics
		3.2	Inspect, test and assess the operational function of the flow control and associated valves using appropriate test equipment and techniques against specifications
4	**Repair or replace refrigerant flow control**	4.1	Select for replacement/repair appropriate flow control or components relevant to system operation using manufacturers' catalogues and specifications
		4.2	Remove and safely contain the refrigerant from the system in accordance with refrigeration principles and procedures and relevant standards and codes
		4.3	Dismantle faulty components and repair/replace to manufactures' specifications, as required
		4.4	Select replacement parts from manufactures catalogues
5	**Return to service refrigerant flow control**	5.1	Evacuate system and recharged with refrigerant safely, in accordance with refrigeration principles and procedures and relevant standards and codes
		5.2	Leak test system and adjust flow control to manufacturers' specifications
		5.3	Undertake performance check and return to service
		5.4	Complete maintenance records/service reports according to SOPs and legislative requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Associated valves include one (1) or more of the following:	• check valves • solenoid valves
Test equipment includes one (1) or more of the following:	• refrigeration gauges • thermometers • multimeter • vacuum pump • leak detector • associated hand tools • specialised hand tools
Performance incudes:	• pressures, temperatures and relationships

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18096A Maintain, repair/replace and adjust refrigerant flow controls and associated equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18096 Maintain, repair/replace and adjust refrigerant flow controls and associated equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18096A Maintain, repair/replace and adjust refrigerant flow controls and associated equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, catalogues, specifications and relevant legislation with respect to maintaining, repairing/replacing and adjusting refrigerant flow controls and associated equipment
- selecting and using appropriate tools, techniques and test equipment necessary to inspect, test and assess the operational function of the flow control valves and components for correct operation and conformance against specifications
- removing the refrigerant from the system and containing in accordance with procedures and regulatory requirements
- identifying and localising faulty components and confirming malfunction by inspection/testing, and making required adjustments to achieve specifications
- removing/dismantling and reassembling faulty components and selecting replacement parts from manufacturers' catalogues to meet the required specifications
- undertaking calculations and numerical operations associated with maintaining, repairing/replacing and adjusting refrigerant flow controls and associated equipment
- evacuating the system and recharging with refrigerant, and leak testing system and adjusting flow control to manufacturers' specifications in accordance with refrigerant principles and procedures
- undertaking performance check to meet specifications
- completing all maintenance records/reports in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operation of refrigerant flow controls, including:
  - Thermal Expansion Valve (TEV)

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  - internal equalised
  - external equalised
  - direct operating
  - servo operated
  - pilot operated
- Maximum Operating Pressures (MOP), cross charged, gas charged, capillary tube, thermo electric, electronic TEV and controllers, low side floats, high side floats, distributors, reversing valves, solenoid valves, non-return valves, evaporator pressure regulators (EPR) valves, crankcase pressure regulating (CPR) refrigeration valves, condenser bypass valves, liquid level controllers, AX valves and hand expansion valves
- measuring instruments/equipment, specifications and procedures for checking temperature(s)
- measuring instruments/equipment, specifications and procedures for checking components
- tools, equipment, techniques and procedures for performing preventative maintenance and sequence of implementation
- procedures for identifying refrigerant type and safely removing the refrigerant and charging the system including all legislative and regulatory requirements
- tools, equipment, techniques and procedures for dismantling, repairing, reassembling and testing components
- process for selecting replacement parts
- specifications, operational characteristics and process for identifying system components
- procedures for reporting non-conformances and completing maintenance records/service reports.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, repairing/replacing and adjusting refrigerant flow controls and associated equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18097 Manufacture cavity dies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18097 Manufacture cavity dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18097A Manufacture cavity dies.

Application

This unit of competency defines the skills and knowledge required to prepare to manufacture and manufacture cavity dies, including matching use of hand and hand held power tools, assembly of the tooling components and trialling the tooling.

Where the selection and use of welding processes are required select appropriate units.

Where brazing or silver soldering is required unit MEM05006 Perform brazing and/or silver soldering should also be selected.

Where manufacture of press tools and gauges is required unit MEM18014 Manufacture press tools and gauges should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM07005	Perform general machining
MEM07006	Perform lathe operations
MEM07007	Perform milling operations
MEM07008	Perform grinding operations

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MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12006	Mark off/out (general engineering)
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM12026	Perform advanced trade calculations in a manufacturing, engineering or related environment
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18015	Maintain tools and dies
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to manufacture cavity die**	2.1	Determine tooling requirements from customer's components drawings, prints or sample component
		2.2	Develop the tooling type and design and plan with reference to customer's specifications (written or verbal) for numbers, finish, quality and material
		2.3	Assess production machine to be used to produce components and consider in tooling design
		2.4	Interpret tool design from tooling drawings, prints or plan and check against customer requirements
		2.5	Determine selected production machine mounting requirements to ensure any special or additional provisions are incorporated in tooling design
3	**Manufacture tooling**	3.1	Select and obtain appropriate materials to meet tooling requirements for strength, durability, component finish and heat treatment qualities, where necessary, and account for materials availability
		3.2	Test selected material for hardness, as appropriate, to aid selection of machine tools, hand tools and hand held power tools to be used to fashion or shape tooling components
		3.3	Develop plan to sequence and stage manufacturing process, including establishing datum, mark out, rough out (machine or fashion), stress relieve/heat treat, finish size, fashion and fit and assemble componentry
4	**Perform machining**	4.1	Select appropriate machines and machining process from a range of standard tool room machines to shape/produce

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	operations		tooling components to specifications
5	**Use hand and hand held power tools**	5.1	Select a range of hand and hand held power tools and use to fashion/manufacture tooling components to specification
		5.2	Produce components sample or section for testing, where practicable
6	**Assemble tooling components**	6.1	Check and fit/assemble to specifications using acceptable tool making techniques and procedures components
7	**Trial tooling**	7.1	Check first-off component with precision instruments against specification
		7.2	Modify tooling to produce components to specification, as necessary
		7.3	Re-trial modified tooling and produce component
		7.4	Verify conformance to specification and report according to SOPs
		7.5	Record all deviations or modifications to original tooling design, prints or plans and report according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tooling includes one (1) or more of the following:	• forging dies • extruding dies • die casting (high and low pressure and gravity feed) • plastic moulds (injection, compression, blow and foam) • glass moulds • dies requiring precision manufacture
Tool room equipment includes one (1) or more of the following:	• lathes • mills • copy/duplicator • grinders • electrical discharge machining (EDM) and wire cut equipment • precision measurement • hand and power tools

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM18097 Manufacture cavity dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18097A Manufacture cavity dies.

Links

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Assessment Requirements for MEM18097 Manufacture cavity dies

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM18097 Manufacture cavity dies (Release 1).

Release 1. Supersedes and is equivalent to MEM18097A Manufacture cavity dies.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting drawings, prints and/or sample components, specifications and customer requirements with respect to manufacturing cavity dies
- sketching or drawing the tooling design incorporating mounting requirements into tooling design and planning with reference to customer specifications for numbers, finish, quality and materials
- selecting and obtaining appropriate materials to meet tooling requirements and testing for hardness using appropriate hardness tester ensuring rating meets customers specifications
- shaping/producing tooling components to specifications using appropriate machines and machining processes
- fashioning/manufacturing tooling components using hand and hand held power tools to specifications
- assembling and fitting tooling components using acceptable tool making techniques and procedures
- producing first-off component/product and checking for conformance, trialling and modifying, where necessary, to meet specifications and verifying conformance
- recording/reporting modifications or alterations to original tooling design in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- customers' tooling requirements and the type of tooling to be manufactured
- machine(s) in which the tooling is to be used
- tooling design concept and performance requirements in terms of customer specifications and proposed production machine(s)

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- method of mounting the tooling in the production machine into which it is to be installed
- physical properties of a range of tool steels
- appropriate materials for each component of the tooling to be produced and reasons for selecting the chosen materials in terms of strength, durability, component finish, heat treatment requirements and availability
- procedures for hardness testing of materials
- tools, equipment, techniques and procedures for fitting/assembling the tooling components
- effect of material hardness on machinability of the material
- appropriate machinery and tools to be used to fashion or shape tooling components and reasons for selection
- procedures for documenting plans for the manufacture of tooling
- reasons for establishing a sequential plan for the manufacture of tooling
- hand and hand held power tools to be used to fashion/manufacture the required tooling components and reasons for selection
- precautions to be taken when fitting/assembling tooling components
- appropriate precision instruments for checking the components produced
- specifications of the finished product and causes of any non-conformance to specification
- tool making techniques/procedures to be applied to return the tooling to specification
- procedures for recording/reporting modifications and/or alterations to tooling design
- procedures for reporting/recording the conformance of the component/product produced by the tooling to specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in manufacturing cavity dies at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM18098 Prepare to perform work associated with fuel system installation and servicing

Modification History

Release 1. Supersedes and is equivalent to MEM18098A Prepare to perform work associated with fuel system installation and servicing

Application

This unit of competency defines the skills and knowledge required to prepare for work associated with fuel system installation and servicing.

It applies to personnel who install or service fuel systems and equipment. They will typically undertake this in a service station forecourt which may be operational or be shut down for refurbishment or under construction.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Plan and prepare for installation or servicing task**	2.1	Clarify job requirements and variations to work plan and take appropriate action
		2.2	Obtain required work permits
		2.3	Identify and comply with emergency and safety procedures for worksite
3	**Confirm location and nature of key fuel system components**	3.1	Identify and locate above and below ground storage components
		3.2	Identify and locate fuel conveying, pumps and dispensing systems
		3.3	Confirm location of fuel system components with site plan
		3.4	Identify and report any hazards and/or inconsistencies with site plan, equipment drawings and regulatory requirements
4	**Assess and manage risks associated with the work**	4.1	Identify fuels and other hazardous materials and other hazards on site
		4.2	Identify and confirm shut-off procedures, details of evacuation plan and location of emergency equipment
		4.3	Assess hazards and determine risks and apply

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	appropriate control measures to control risks
	4.4 Select appropriate tools and equipment to be used on the job
	4.5 Identify nature and location of required isolations
	4.6 Determine the type of, and appropriate locations for, barriers to prevent unauthorised access to the work location and put them in place before job commencement

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Work permits include one (1) or more of the following:	• permits issued by client • permits using the Australian Institute of Petroleum (AIP) form • other work documents required for the job • hot work • cold work • confined space • excavation • working at heights

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Emergency and safety procedures for worksite include one (1) or more of the following:	• specific procedures for that site • location of emergency shut-off and procedures for re-setting emergency shut-off • dealing with spills or other losses in containment • fire response • other incident response procedures for that site • other site-specific hazards and procedures
Storage components include one (1) or more of the following:	• single wall tanks • jacketed steel tanks • double-walled tanks (dry and liquid filled interstitial space) • fibre composite (FRP) tanks • high density polyethylene (HDPE) tanks
Fuel conveying systems include one (1) or more of the following:	• steel pipes • HDPE pipes • vapour recovery systems and pipes • pipe joining
Pumps and pump systems include one (1) or more of the following:	• centrifugal pumps • positive displacement pumps • pressure and suction systems • pumping problems • multiproduct pumps
Dispensing systems include one (1) or more of the following:	• fuel metering • hoses and nozzles • stage two vapour recovery • flow control valves • discharge control • multiproduct dispensers

Corrosion protection systems and components include one (1) or more of the following:	• cathodic protection, including:
	  • impressed current
	  • sacrificial anode
	• wrapping
	• coating

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fuels include one (1) or more of the following:	• petrol • ethanol blend fuels (of various concentrations) • diesel and biodiesel • liquefied petroleum gas (LPG)
Hazardous materials include one (1) or more of the following:	• ‘solid’ pool chlorine (calcium hypochlorite) • ‘liquid’ pool chlorine (sodium hypochlorite solutions) • lubricants • cleaning agents • gas bottles • workshop materials

Appropriate tools include:	• tools that are:
	  • intrinsically safe
	  • ergonomically appropriate to the job
	  • safe and in good condition

Required isolations include one (1) or more of the following:	• lock out/tag out • double block and bleed • use of blanks, blinds and goggles • removal of spool piece • removal of mechanical drives
Barriers include one (1) or more of the following:	• temporary fencing • bollards • witches hats • tapes • signage
Problems include one (1) or more of the following:	• variations to the work schedule • variations to the work scope • issues with the public or site personnel • failure of equipment • inappropriate/incomplete permit or work instructions

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18098A Prepare to perform work associated with fuel system installation and servicing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18098 Prepare to perform work associated with fuel system installation and servicing

Modification History

Release 1. Supersedes and is equivalent to MEM18098A Prepare to perform work associated with fuel system installation and servicing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining relevant work permits and other work documents required for the job
- identifying and complying with emergency and safety procedures relevant to the site
- identifying types of fuel and their associated hazards
- identifying fuel delivery systems and their associated hazards, including pressure, suction, flammability, explosive potential, toxicity and static electricity
- determining appropriate control measures using hierarchy of control and identifying support and assistance requirements and establishing plan for the performance of work
- applying any state/territory licensing, work health and safety (WHS) and environmental legislation, standards and industry codes of practice
- relating to people from a range of social, cultural and ethnic backgrounds and of varying physical and mental abilities.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of fuels and their associated hazards
- fuel delivery systems and associated hazards, including pressure, suction, flammability, explosive potential, toxicity and static electricity
- dangerous goods classification and labelling
- storage and handling of dangerous goods
- suction/pressure systems
- first stage vapour recovery systems
- second stage vapour recovery systems
- pumps and pumping principles and problems
- fuel dispensing and metering systems

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- interpretation of permits, site maps and hazard maps
- regulatory requirements, including licensing, WHS and environmental regulations.

Assessment Conditions

- Assessors must:
  - have vocational competency in preparing to perform work associated with fuel system installation and servicing at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18100 Fault-find, test and rectify AC machines and circuits

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson –industrial electrician apprenticeship training and the recognition of trade-level skills in locating and rectifying faults in alternating current (AC) machines and circuits.

It covers characteristics including their construction and operating principles. It also includes their application, control and protection methods, reversal of rotation and the requirements to limit starting current as well as skills in testing and fault finding, including abnormal operating conditions.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 12 – Demonstrate the rationale and operating principles and characteristics of three phase induction motors and generators. Describe AS/NZS 3000 requirements and knowledge of local Supply Authority requirements for three phase motor installations and starters.
- EPC 14 – Demonstrate knowledge of possible causes of malfunction of three phase induction motors and demonstrate the tests required for diagnosing faults.
- EPC 15 – Describe the operating principles, characteristics, and suitability of typical control methods for single-phase motors and their key components.

And

Essential Performance Capability (EPC) classified as ‘critical’:

- EPC 13 – Demonstrate a knowledge of methods of electric motor selection, starting, connection and protection.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

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Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM12023	Perform engineering measurements
MEM18001	Use hand tools
MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Research the nature of the fault through checking of documentation and/or consultation with appropriate person
2.	Prepare to fault find on AC machines	2.1	Obtain all necessary tools, equipment and testing instruments needed to conduct fault diagnosis of AC

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
and associated control circuits	machines and circuits
	2.2 Isolate and tag circuits and equipment in accordance with procedures
3. Fault find AC machines and associated control circuits	3.1 Apply diagnostic techniques to solve problems in AC machines and their associated control circuits, including the use of specialised test equipment
	3.2 Test single and three-phase windings for continuity and insulation resistance between windings and to earth with appropriate test equipment
	3.3 Dismantle and reassemble AC machine using appropriate fitting techniques, equipment and tools in accordance with specifications and procedures, if required
	3.4 Remove/repair/replace faulty components/circuits in accordance with manufacturer specifications and regulatory requirements
	3.5 Test AC machine/circuit to ensure functionality in accordance with specifications
	3.6 Document all necessary repairs in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

AC machines include three (3) or more of the following:	• single-phase motors • three-phase motors • variable speed drives (VFDs) • synchronous machines • non-rotating AC equipment and components
Control starter circuits include one (1) or more of the following:	• direct-on-line (DOL) • star-delta • autotransformer • primary resistance • secondary resistance
Split phase induction motors include:	• split-phase motor • capacitor-start motor • capacitor-start, capacitor-run motor • permanently-split capacitor motor • shaded-pole motor
Environmental protection and general enclosure types include:	• open motors • protected motors • drip-proof motors • duct ventilated • totally enclosed • flameproof
Specialised test equipment includes one or more of the following:	• built-in systems (software and site displays) • vibration monitors • infra-red temperature sensing device
Rotating electrical machines in general requirements include:	• AS 1359.106-1996 Rotating electrical machines – General requirements – Methods of cooling (IC Code)
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules
Safe working practices include:	• Demonstration of safe working practices and installation in accordance with industry established safe and sound practices

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Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18100 Fault-find, test and rectify AC machines and circuits

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings and specifications relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and up to date
- using specialised test equipment, including condition monitoring equipment to conduct on-line analysis
- carrying out on-line functional tests for voltage and current using a voltmeter or multimeter and a clip on ammeter
- applying fault finding and diagnostic techniques on at least three (3) or more of the following AC machines and circuits:
  - single-phase motors
  - three-phase motors
  - variable speed drives (VSDs)
  - synchronous machines
  - non-rotating AC equipment and components
- carrying out electrical tests for continuity and insulation resistance tests; between windings and to earth of single and three-phase motors
- dismantling, replacing and assembling single and three-phase AC machines using appropriate hand and power tools in accordance with manufacturer specifications, if required

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- complying with the Australian/New Zealand Wiring Rules and local supply requirements for three-phase motor installations and starters
- using a synchroscope for paralleling of alternators
- documenting all necessary repairs in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- three-phase induction motors, including:
  - basic component parts of a three-phase induction motor, i.e. stator and rotor (squirrel-cage and wound rotor)
  - motor enclosures
  - terminal block arrangements – connecting a three-phase motor in both star and delta
  - operating principles, including:
    - rotating magnetic fields
    - rate of rotation and factors affecting it
    - direction of rotation and reversal
  - induction and its effects, including:
    - torque
    - slip
    - rotor frequency
  - operating characteristics, including:
    - squirrel-cage rotors
    - special purpose squirrel-cage rotors
    - wound-rotor motors
  - operating parameters for induction motors
- single-phase induction motors, characteristics and operating principles of the following:
  - split-phase motor
  - capacitor-start motor
  - capacitor-start, capacitor-run motor
  - permanently-split capacitor motor
  - shaded-pole motor
- series motor – operating characteristics and reversing the direction of rotation
- comparison of single-phase and three-phase motors and advantages and disadvantages of three-phase motors
- abnormal operating conditions for three-phase motors, including:
  - phase reversal, single phasing and overloading
  - voltage fluctuation, higher operating temperatures, frequency variation, overloading and frequent starting

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    - other factors, including exposure to corrosive fumes, explosive vapours, dust, steam, salt air, high humidity, operation in ambient temperature of below approximately 100C or above 400C, or operation at altitudes in excess of 1000 metres
- abnormal operating conditions for single-phase motors, including centrifugal switch failure
- diagnostic techniques including the use of specialised test equipment, including growlers
- electrical tests for continuity and insulation resistance tests; between windings and to earth of single and three-phase motors
- testing, including the following:
    - DC test – to determine the stator resistance
    - no-load test – to determine the rotational losses and magnetisation current
    - locked rotor test – to determine the rotor and stator impedances
    - thermography and condition monitoring
- dismantling three-phase motors, including application of ‘witness marks’
- operation of a ’growler’ to perform voltage drop testing of armatures of the series or universal motor
- electric motor control and protection, including:
    - reasons why motor protection is required
    - Australian/New Zealand Wiring Rules and local supply requirements for three-phase motor installations and starters, including:
        - isolation and switching
        - automatic starting
        - emergency stopping
        - starting methods for limitation of starting currents
- three-phase motor starters and their operating principles and characteristics, including:
    - DOL
    - star-delta
    - autotransformer
    - primary resistance
    - secondary resistance
- various types of motor overload protection, including high rupture capacity (HRC) fuses
- operating principles of magnetically activated over-current relays, thermally activated over-current relays and combined thermal-magnetic over-current relays
- temperature-dependent resistor protection
- under-voltage and over-voltage protection
- single-phasing and reverse-phase sequence protection and the protection methods
- types of enclosures to give environmental protection, including:
    - open - ends of machine are open allowing free ventilation with fan attached to the motor shaft to draw air through the motor
    - protected - protection obtained by fastening steel wire mesh or perforated metal over enclosures with fan attached to the motor shaft to draw air through the motor

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  - drip proof - an advance on the protected motors with openings further protected by a hood to prevent foreign materials or moisture from falling vertically into motor
  - duct ventilated - air is drawn from outside through a duct or air is forced via a blower through a duct to the motor
  - totally enclosed - no contact between the air outside and inside the machine can be classified as waterproof, weatherproof or submersible
  - flameproof - totally enclosed motor with additional precautions, including to seal bearings and used where there are flammable gases and risk of explosion if spark enters the atmosphere
- AS 1359.106-1996 Rotating electrical machines – General requirements – Methods for cooling (IC Code)
- three-phase motor braking and the principles of operation of the major types, including mechanical, eddy current, dynamic, regenerative and plug
- altering the speed of AC induction motors by varying the number of poles or frequency
- VSDs, including:
  - methods and operating principles
  - installation requirements
  - shielding and filtering
  - harmonics and power factor
  - performance characteristics
  - set up and commissioning
  - common faults – their symptoms and causes
- three-phase synchronous machines – alternators:
  - construction and operating principles
  - excitation and generated voltage
  - effect of load on alternator voltage
  - effect of power factor on output voltage of an alternator
  - voltage regulation
  - alternator ratings expressed in kVA
  - parallel operation of alternators – synchronising and the methods used to achieve synchronisation, including the use of a synchroscope
  - effects of a change in excitation when connecting two alternators in parallel
- three-phase synchronous machines – motors:
  - construction and operating principles
  - effect of a load on a synchronous motor
  - effect on varying the field (DC) excitation, including changes in power factor
- hunting in three-phase synchronous machines and the methods used to reduce this effect, including the use of amortisseur windings in the pole faces of the rotor
- starting methods and applications of three-phase synchronous motors
- single-phase synchronous motors:
  - the primary purpose and the major types: reluctance and hysteresis motors
  - applications of single-phase synchronous motors

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- standby power supplies including uninterruptable power supplies (UPS) and the purpose they provide, i.e. mains power at a specified voltage and frequency
- standby engine driven alternators starting methods and sequence of operation
- non-rotating AC equipment and components including construction, operation and application of:
  - linear motors and actuators
  - solenoids, relays and contactors
  - welders and other non-rotating AC machines.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding, testing and rectifying AC machines and circuits at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18102 Fault-find, test and rectify single and three-phase transformers

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in fault finding and rectifying single and three-phase transformers.

It includes the operating principles of transformers, their construction and open circuit and full load characteristics; types of transformers used in transmission and distribution systems, appliances and welding machines; hazards associated with step and touch voltages, induced voltages and stored energy particularly with high voltages; earthing requirements to limit the rise of touch voltage; safe working procedures for connecting and testing and fault finding transformers.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs):

- EPC 18 – Describe the basic construction, principles of operation, and typical applications of the main types of transformers.

And

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 19 – List the key safety issues of various types of transformers, including AS/NZS 3000 requirements.
- EPC 48 – Demonstrate knowledge and understanding of the significant dangers of High Voltage equipment and distribution systems.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

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Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM12023	Perform engineering measurements
MEM18001	Use hand tools
MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1.	Determine job requirements	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Research the nature of the fault through checking of documentation and/or consultation with appropriate person
2.	Prepare to fault find single and three-phase transformers and associated circuits	2.1 Obtain all necessary tools, equipment and testing instruments needed to conduct fault diagnosis of single and three-phase transformers and circuits
		2.2 Isolate and tag circuits and equipment in accordance

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	with procedures
3. Fault find single and three-phase transformers and associated circuits	3.1 Apply diagnostic techniques to fault find single and three-phase transformers and associated circuits using appropriate test equipment
	3.2 Remove/repair/replace faulty components/circuits in accordance with manufacturer specifications and regulatory requirements
	3.3 Test single and three-phase transformers associated circuits to ensure functionality in accordance with specifications
	3.4 Carry out routine maintenance on transformers, including oil testing, silica gel change and bushing repairs, where applicable
	3.5 Document all necessary repairs in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Transformers include two (2) or more of the following:	• instrument
	• current
	• voltage
	• oil filled transformers
	• high voltage (HV) power transformers
	• low voltage (LV) power transformers
	• neutral
	• distribution:
	  • step up
	  • step down

Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18102 Fault-find, test and rectify single and three-phase transformers

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings and specifications relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and up to date
- observing work health and safety (WHS) precautions and considerations when dealing with instrument transformers especially current transformers and high voltage equipment
- applying fault finding and diagnostic techniques on at least two (2) or more of the following single and three-phase transformers and their associated control circuits:
  - instrument
  - current
  - voltage
  - oil filled transformers
  - high voltage power transformers
  - low voltage power transformers
  - neutral
  - distribution:
    - step up
    - step down

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- complying with the Australian/New Zealand Wiring Rules for the installation and safety requirements of transformers, including limiting the rise of touch voltages
- performing the following tests in accordance with specifications and regulatory requirements:
  - basic insulation resistance, continuity and winding identification tests
  - open and short circuit tests
- carrying out routine maintenance on transformers
- documenting all necessary repairs in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operating principles of transformers, including:
  - principles of mutual induction and how it relates to a transformer
  - phasor diagram for a transformer on no-load and the voltage and current components
  - factors that determine the value of induced voltage in a transformer winding
  - transformers ratios both voltage and current
  - calculate the value of output voltage given the input voltage and turns ratio of a transformer
- transformer losses, including:
  - eddy current losses and the use of laminations to reduce this effect
  - hysteresis losses and core materials to reduce this effect
  - copper losses also referred to as primary/secondary losses or I2R losses
  - transformer efficiency and the effect flux leakage has on it and its related formula, i.e. transformer efficiency $= \frac{output}{output + losses}$
  - voltage regulation as applicable to a transformer and its related formula, i.e. voltage regulation = $\frac{VNL - VFL}{VFL} \ X \ 100\%$
- power in a transformer, i.e. power in = power out
- impedance ratio and reflected impedance
- percentage impedance as applied to transformers and how its value affects the value of the available short-circuit current
- calculating the percentage impedance of a transformer and determine the percentage impedance of a transformer from test results
- transformer construction, including:
  - single and three-phase transformer cores and winding arrangements
  - transformer ratings, i.e. in kVA
  - relationship between transformer cooling and rating
  - methods used for natural and forced cooling of transformers

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- properties and tests that are conducted on transformer oil
- winding polarities and polarity identification of single and three-phase transformers
- four common methods of connecting the primary and secondary windings of a three-phase transformer, i.e. star-star, delta-delta, delta-star and star-delta
- three-phase tertiary windings and the purpose they perform
- changing transformer ratios, i.e. off-load and on-load changing
- transformer auxiliary equipment and their function (bushings, surge-diverters, tap-changers, hot oil and winding indicators, breather, Buchholz relay and conservator)
- application of transformers, including welders

- paralleling of single-phase transformers, including:
  - ensuring their voltages are equal
  - instantaneous polarities are identical
  - consequences of incorrectly phased transformers
- paralleling of three-phase transformers, including:
  - the need for paralleling
  - ensuring they are of equal voltages, same phase sequence and phase voltages are in step and the consequences if they are not
- testing of transformers, including:
  - performing basic insulation resistance, continuity and winding identification tests
  - testing of final connections, i.e. in star, delta and open-delta configurations and transformer ratio
  - safe working procedures when connecting and testing transformers
  - open and short circuit tests
  - dielectric tests
- special transformers, including:
  - potential and current transformers and the reason why they are used
  - construction and application of potential and current transformers
  - work health and safety (WHS) hazards associated with instrument transformers especially current transformers where the secondary must never be open-circuited under any circumstances as it will cause a potentially dangerous voltage to be present at the secondary terminals
  - instrument transformer load or burden ratings
  - safe working procedures of potential and current transformers
  - commissioning and testing instrument transformers
  - transformers with multiple secondaries and tapped windings
  - advantages and disadvantages of auto-transformers
  - calculate the voltage and current in the windings of an auto-transformer
  - high-reactance or leakage transformers
  - applications of auto-transformers and instrument transformers

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- Australian/New Zealand Wiring Rules installation and safety requirements for transformers
- dangers of high voltage equipment and distribution systems, including:
  - step and induced voltages
  - sources of induced voltage and stored energy
  - creepage and clearance requirements
  - application of safe working procedures in the vicinity of high voltage equipment.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding, testing and rectifying single and three-phase transformers at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18103 Fault-find, test and rectify electrical circuits and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in finding and rectifying faults in electrical circuits and equipment.

It covers safe fault finding testing and procedures in a range of electrical circuits and equipment as well as the rectification of those faults in accordance with the relevant standards.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capability (EPC) classified as ‘critical’:

- EPC 54 – Demonstrate the knowledge and skills for diagnosing and rectifying faults in electrical apparatus and associated circuits.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM12023	Perform engineering measurements
MEM18001	Use hand tools

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MEM18100	Fault-find, test and rectify AC machines and circuits
MEM18102	Fault-find, test and rectify single and three-phase transformers
MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Research the nature of the fault through checking of documentation and/or consultation with appropriate person/s
2.	Prepare to fault find and rectify electrical circuits and equipment	2.1	Obtain all necessary tools, equipment and testing instruments needed to conduct fault diagnosis and repair of electrical circuits and equipment
		2.2	Isolate and tag circuits and equipment in accordance with procedures
3.	Fault find and rectify electrical circuits and equipment	3.1	Apply diagnostic techniques to locate faults in electrical circuits and equipment, including the use of specialised test equipment
		3.2	Dismantle equipment, where necessary, and repair/replace faulty items and reassemble using

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	appropriate tools and equipment in accordance with manufacturer specifications and regulatory requirements
	3.3 Test repaired electrical circuits and equipment to ensure functionality and compliance
	3.4 Document reasons and all necessary repairs in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Circuits include two (2) or more of the following:

- power distribution
- lighting control
- distributed control system (DCS) instrument loop control
- motor control
- package unit control

Single circuit may be controlled by one or more devices and the output may control one or more devices

Complex circuit is defined as interdependent circuits and applies to interconnected electrical circuits where electrical equipment and/or components are connected electrically, that is there are multiple electrical power supplies or sources, voltages or circuits which are found in the control or switching of the circuit

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes three (3) or more of the following single and three-phase appliances:	• single-phase appliances – hand held power tools, fridges, microwaves, TV's, lighting, motors, air conditioning units, air compressors, portable pumps, pedestal drills, lathes, bench grinders, motors, fans and fan motors • three phase appliances – variable speed drives (VSDs), fan and pump motors, welding machines, freezer units, heaters, general commercial kitchen equipment, generators, air conditioning units, air compressors and air blowers
Diagnostic techniques include:	• testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity
Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • multimeters • tong testers • wattmeters • cathode ray oscilloscopes (CROs)
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18103 Fault-find, test and rectify electrical circuits and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings and specifications relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and up to date
- applying methodical diagnostic techniques and using safe working practices to fault find electrical circuits and equipment
- using test equipment, including the use of multimeters, cathode ray oscilloscopes (CROs), signal/function generators and power supplies in diagnosing faults in electrical circuits and equipment
- taking measurements and compare the results to the calculated value
- dismantling, repairing and replacing faulty components and equipment using appropriate hand and power tools and engineering techniques
- carrying out electrical tests for continuity and insulation resistance tests on single and three-phase appliances and equipment
- repairing faulty electrical installation circuits, components and wiring to comply with relevant standards
- retesting according to regulatory and legislative requirements
- documenting all reasons and remedial action taken in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- fault finding techniques, including:
  - visual inspection
  - signal injection and measurement
  - half split rule and component isolation
  - interpreting wiring and equipment circuits, drawings and specifications
- test equipment for diagnosing faults including multimeters, ammeters, voltmeters, continuity testers, wattmeters and tong testers
- specialised alternating current (AC) test equipment, including:
  - CRO and its operating features, interpreting a CRO screen, dual trace CROs and its advantage over a single trace CRO and CRO applications
  - signal, function generators and power supplies and their operating features and applications when fault finding AC circuits
- diagnostic techniques, including testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity
- wiring faults, including short circuit, open-circuit, high resistance, breakdown in insulation resistance, residual current device (RCD) tripping, transposition of conductors, earthing, loose connections and corrosion
- power distribution, lighting control, signal and data, motor control and package unit control circuits
- lighting faults, including switching, lamp holders, ballast, starter, capacitor, igniter, transformer, loose connections, poor contact, corrosion and lighting management systems
- equipment faults in the following single-phase appliances:
  - hand held power tools, fridges, microwaves, hot water systems, TV’s, motors, air conditioning units, air compressors, portable pumps, pedestal drills, lathes, bench grinders, motors, fans and fan motors
- equipment faults in the following three-phase appliances:
  - variable speed drives (VSDs), fan and pump motors, freezer units, welding machines, heaters, general commercial kitchen equipment, generators, air conditioning units, air compressors and air blowers
- mechanical faults in motors, including bearings, fans, bent shaft, locked rotor, blocked air vents, centrifugal switches, slipping belts and environmental factors.

Assessment Conditions

- Assessors must:
  - have vocational competency in fault finding, testing and rectifying electrical circuits and equipment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18104 Dismantle, replace and assemble electrical components and equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson - industrial electrician apprenticeship training and the recognition of trade-level skills in dismantling, replacing and assembling electrical components and equipment which are designed to operate at voltages greater than 50 V alternating current (AC) or 120 V direct current (DC).

It covers dismantling and identifying faulty components, selecting replacements, and assembling electrical components into assemblies or sub-assemblies, including the safe use of hand and power tools and interpretation of mechanical drawings/diagrams.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

Path 1	MEM12023	Perform engineering measurements
	MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the Performance criteria describe the performance needed to

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essential outcomes.	demonstrate achievement of the element.	
1. Determine job requirements	1.1	Follow standard operating procedures (SOPs)
	1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
	1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2. Dismantle electrical components and equipment	2.1	Obtain all necessary tools, equipment and measuring devices needed to dismantle electrical components and equipment
	2.2	Isolate and tag circuits and equipment in accordance with procedures
	2.3	Inspect electrical component/equipment and analyse task requirements
	2.4	Select the appropriate tools and equipment
	2.5	Ensure all applicable handheld power tools are tested and tagged and are checked for correct operation and safety
	2.6	Dismantle the item according to engineering drawings, manufacturer requirements and SOPs
	2.7	Mark electrical components to aid in reassembly
3. Identify faulty components and select replacement	3.1	Obtain and interpret specifications for components from appropriate source
	3.2	Assess damaged or faulty components against specifications in accordance with procedures and manufacturer requirements
	3.3	Identify faulty components and arrange for repair, replacement or adjustment in accordance with procedures and manufacturer requirements

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		3.4	Select replacement and/or repaired parts for reassembly in accordance with specifications and procedures
4.	Assemble electrical components and equipment	4.1	Apply appropriate techniques to assemble electrical components/equipment using fastening equipment and methods which ensure conformance to specifications and operational performance
		4.2	Select, where appropriate, correct lubrication, packing and sealing materials and apply them in accordance with job specifications
		4.3	Inspect, test and adjust assembled electrical component/equipment as necessary for compliance with operational specifications and return to use in accordance with procedures
		4.4	Complete documentation, including all necessary remedial action and reasons why they were carried out, in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electrical components and equipment include one or more of each of the following:	• single-phase appliances – hand held power tools, fridges, microwaves, TV's, lighting motors, air conditioning units, air compressors, portable pumps, pedestal drills, lathes, bench grinders, motors, fans and fan motors • three phase appliances – freezer units, welding machines, fan and pump motors, heaters, general commercial kitchen equipment, generators, air conditioning units, air compressors and air blowers • DC machines • non-rotating AC and DC equipment and components
Appropriate tools and equipment include one or more of the following:	• a range of hand and power tools • bearing pullers • special purpose dismantling and assembly tools
Testing and tagging requirements of portable tools include:	• Those identified in AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment

Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18104 Dismantle, replace and assemble electrical components and equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- Following work instructions, SOPs and safe work practices
- identifying and interpreting circuits, drawings and specifications relevant to the work to be undertaken
- preparing component/equipment for dismantling
- ensuring all handheld power tools are tested and tagged to the requirements of AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- dismantling component/equipment using appropriate techniques, tools and equipment
- marking component/equipment parts appropriately to aid in reassembly
- checking components visually and dimensionally for conformance to specifications
- selecting and confirming replacement parts to specifications from supplier catalogues
- preparing and assembling component/equipment using appropriate techniques and procedures
- undertaking shaft and coupling alignment, where appropriate
- applying lubricants, packing and/or sealing materials, where appropriate, in accordance with the job specifications
- inspecting and checking the final assembly for conformance with operational specifications and returning to use
- documenting all necessary remedial action and reasons why they were carried out in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- mechanical drawing interpretation, including:
  - application of AS 1100.101-1992 Technical drawing – General principles, in accordance with SOPs

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  - conventions used in technical drawings, including relationship between the views contained in the drawing, objects represented, units of measurement, and dimensions of the key features and symbols used
  - correct interpretation of instructions contained in drawings
  - materials from which drawing objects are made and their features and manufacturing/assembly requirements
- power tools, including:
  - application of different power tools, including electric or pneumatic/hydraulic drills, grinders, jigsaws, nibblers, cutting saws, sanders, planers, routers, pedestal drills and grinders
  - clamping/securing methods, including multigrips, vices, jigs, fixtures and clamps
  - adjustments/alignments to a range of power tools
  - common faults and/or defects in power tools
  - procedures for marking unsafe or faulty power tools for repair
  - routine maintenance requirements and cleaning of a range of power tools, including lubricating, tightening, simple tool repairs and adjustments using engineering principles, tools, equipment and procedures to statutory and regulatory requirements
  - tool sharpening techniques for a range of power tools
  - storage location and procedures of a range of power tools
  - safety precautions when using power tools
- precautions to be observed when drilling materials containing asbestos, including the following:
  - undertaking a risk assessment prior to commencement of work
  - a non-powered hand drill or low speed battery-powered drill or drilling equipment fitted with local exhaust ventilation (LEV) dust control hood wherever possible
  - safe working procedures, including applicable PPE
- portable tool safety and tagging system in accordance with the requirements of AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- correct procedures for storage of hand and power tools
- types of seals, bearings, fans and pulleys commonly found in electrical equipment
- non-rotating DC equipment and components, including construction, operation and application of:
  - solenoids, relays and contactors
  - linear actuators
  - Hall effect devices
  - magnetic sensing devices
  - magnetostriction equipment
- dismantling and assembly techniques, including:
  - marking component/equipment parts to aid in reassemble
  - selecting appropriate hand and power tools used in dismantling and assembling electrical components
  - procedures for safe handling and storage of dismantled components.

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Assessment Conditions

Assessors must:

- have vocational competency in dismantling, replacing and assembling electrical components and equipment at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18105 Disconnect and reconnect high voltage fixed wired equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in disconnecting and reconnecting high voltage (HV) fixed wired equipment using appropriate techniques and procedures.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band:

This unit has dual status and is to be regarded as both a specialisation band A unit and Specialisation band B unit for progression to C7 (AQF level IV).

Unit Weight: **3**

Pre-requisite Unit

Path 1	MEM10016	Terminate and test electrical wiring and accessories
	MEM10018	Select cable types and sizes to suit loads and electrical installation environment
	MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Disconnect equipment	2.1	Determine function of electrical of equipment by reference to circuit drawings, schematics, reference manuals, equipment specifications, identification plate and/or consultation with technical adviser
		2.2	Determine and record equipment characteristics, including direction of rotation, where appropriate
		2.3	Identify points of isolation and isolate equipment in accordance with procedures
		2.4	Check that circuits/equipment are isolated and tagged using all appropriate lock-off equipment and signage
		2.5	Note, record and label conductor layout
		2.6	Disconnect conductors and terminate and make safe disconnected cables/connections using appropriate tools, equipment and techniques
3.	Prepare to reconnect equipment	3.1	Plan reconnection ensuring WHS policies and procedures are followed
		3.2	Identify characteristics, including rating of the equipment to be connected, and determine connection requirements
		3.3	Test original and/or replacement item to ensure it is safe to be connected

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4. Connect equipment	4.1 Isolate and tag circuits and equipment in accordance with procedures
	4.2 Check connections and prepare conductors for termination
	4.3 Test the conductors for continuity and insulation resistance readings ensuring they comply with regulatory and legislative requirements
	4.4 Confirm continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
	4.5 Connect conductors to equipment in accordance with specifications and regulatory requirements
	4.6 Fasten/seal all cables/wires/conduit to specifications
	4.7 Remove all lock-off equipment and signage
5. Perform emergency first aid	5.1 Assess situation to identify points of danger to the injured person and potential rescuer
	5.2 Rescue/recover injured person or provide assistance to injured person in accordance with recognised standards/procedures
	5.3 Make contact with the appropriate medical and rescue authorities
	5.4 Record details of first aid given

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate techniques and procedures include:

- Clearances for safe approach as mandated by statutory authorities

Isolation includes:

- Isolating supply for safe disconnection of all electrical power to equipment supply circuit with switch circuit breaker or fuses on circuits/equipment at voltage levels above 1000 V alternating current (AC) and 1500 V direct current (DC)

Test equipment and tools includes one or more of the following:

In accordance with voltage and fault-limiting requirements:

- appropriate proving dead meters
- high potential testers
- voltmeters
- insulation resistance testers
- handheld tools, including pliers, screwdrivers, sockets, spanners, keys, earthing links and operating sticks

Signage includes one or more of the following:

- tags
- access permit holders
- restricted access signs

Unit Mapping Information

No equivalent unit

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18105 Disconnect and reconnect high voltage fixed wired equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- following work instructions, SOPs and safe work practices
- identifying and interpreting specifications, charts, lists, circuit drawings, schematics, regulatory and legislative requirements to disconnect/reconnect HV fixed wired equipment
- checking that the electrical equipment is isolated and tagged where necessary in strict accordance with WHS requirements and procedures using appropriate lock-off equipment and tags/signs
- disconnecting equipment by labelling and recording conductors and making safe disconnected cables/connections using appropriate tools, test equipment, procedures and techniques
- confirming isolation prior to reconnecting fixed wired equipment and checking connections and preparing conductors for termination in accordance with manufacturer specifications and regulatory requirements
- testing conductors prior to connection to ensure continuity, and insulation resistance readings comply with following requirements:
  - checking continuity of the protective earth conductor to determine whether it is sufficiently low
  - testing the resistance between the protective earth conductor and the neutral conductor to determine whether it is sufficiently low – not greater than 2 Ohms
  - testing the insulation resistance of active conductors to confirm that it is greater than 1 Megohm
- testing to ensure continuity is confirmed between the exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- connecting conductors to equipment and fasten/seal cables/wires/conduits using appropriate procedures and tools to relevant specifications and regulatory requirements
- removing all lock-off devices and signage and checking/testing equipment and circuits for compliance to specifications
- rescuing/recovering of injured person in accordance with appropriate standards/procedures and provide first aid, including cardiopulmonary resuscitation (CPR) where appropriate, and contacting the appropriate medical and rescue authorities
- recording details of first aid given.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- any applicable industry standards, national/Australian Standards, NOHSC guides, state/territory regulatory codes of practice/standards and relevant regulatory requirements
- characteristics of the circuit and the equipment, including rating and rotation
- points of isolation for the fixed wired equipment and reasons for selecting the particular isolation point) and reasons for using earthing, lock-off equipment and signs
- clearances from live parts
- safe isolation
- operational specifications of the fixed wired equipment and connections to be made
- procedures for confirming electrical isolation of fixed wired equipment and circuits
- procedures, techniques, tools and equipment to be used for disconnecting/reconnecting conductors
- test requirements to ensure compliant continuity and insulation resistance of conductors
- test requirements to ensure continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- potential dangers/risks associated with work
- recognised procedures for the movement and treatment of the injured person, including HV rescue, clearing of airways, CPR, care of spinal injuries, treatment of cuts/lesions, burns/scalds and treatment of shock
- appropriate local medical and rescue services
- procedures for incident reporting.

Assessment Conditions

Assessors must:

- have vocational competency in disconnecting and reconnecting HV fixed wired equipment at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

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Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18106 Terminate communication and data cables

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in terminating all types of communication and data cables in accordance with the relevant legislative requirements and statutory regulations.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

Path 1	MEM05001	Perform manual soldering/desoldering – electrical/electronic components
	MEM12023	Perform engineering measurements
	MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job	1.1 Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2 Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Identify and mark conductors/cables	2.1 Identify cables and conductors using appropriate test equipment and techniques
		2.2 Label cables and conductors in accordance with procedures, legislative requirements and statutory regulations to specifications
3.	Prepare and terminate cable	3.1 Obtain termination requirements and specifications
		3.2 Maintain the minimum bend radius of the cable in accordance with specifications when cutting cable to required length
		3.3 Prepare cable ends to specifications, legislative requirements and statutory regulations utilising appropriate tools and techniques
		3.4 Terminate cables according to specifications using appropriate tools and techniques
		3.5 Test/examine terminations for compliance with specifications
4.	Fix/secure cables	4.1 Fix/secure cables utilising appropriate fixing/securing techniques
		4.2 Use the proper cable management hardware to support the in-place cables and relieve tension

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Legislative requirements and statutory regulations include one or more of the following:	• ACA Technical Standards AS/ACIF008, AS/ACIF009 • SAA Communications Cabling Manual (Open) • AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) • Telecommunications Act 1997
Types of cables include one or more of the following:	• thermocouple/compensator cables, including mineral-insulated metal sheath (MIMS) • transmission cables • thermoplastic/elastomer insulated/sheathed • compensating cables • coaxial • telephone • category 5 • optical fibre • extra-low voltage (ELV) control cables
Minimum bend radius includes:	Bend radius according to manufacturer specifications, including: • 4 times the cable diameter for unshielded twisted pair (UTP) and screened twisted pair (ScTP) cables • 10 times the cable diameter for optical fibre cable
Tools include one or more of the following:	• krone tool • cable strippers • crimping tools, e.g. RJ45 crimping tool • slitter tool • pliers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Terminations include one or more of the following:

- crimp
- wire wrap (non-insulated and pre-insulated)
- solder
- connectors
- multi-terminal plugs and sockets
- fibre optics
- coaxial
- terminal blocks
- punch-down connections

Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18106 Terminate communication and data cables

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, SOPs and safe work practices
- identifying and interpreting specifications, data sheets, legislative requirements and statutory regulations and obtaining relevant data with respect to terminating signal and data cables
- identifying cables and conductors and label in accordance with requirements, procedures and regulations
- maintaining the minimum bend radius of the cable according to manufacturer specifications
- preparing and terminating cables using appropriate tools and techniques to specifications
- testing terminations for compliance with specifications
- using the proper cable management hardware to support the in-place cables and relieve tension
- fixing/securing cables in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- legislative requirements and statutory regulations, including ACA Technical Standards AS/ACIF008, AS/ACIF009, SAA Communications Cabling Manual (Open), AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) and Telecommunications Act 1997
- test equipment, techniques and procedures to be used to identify cables and conductors
- labelling requirements and procedures for labelling cables and conductors
- minimum bend radius for communication and data cables
- termination requirements, specifications and procedures, tools and techniques for preparing and terminating cables
- procedures for testing cables and terminations

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- factors that influence selection of fixing/securing techniques, including cable management hardware.

Assessment Conditions

Assessors must:

- have vocational competency in terminating communication and data cables at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM18108 Troubleshoot analog and digital electronic equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in troubleshooting analog/digital electronic equipment down to sub-assembly and/or card level where a series of checks and pre-determined tests is applied in accordance with workshop manuals and testing procedures.

It applies to a wide range of electronic systems and sub-assemblies used in an industrial environment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

Path 1	MEM12023	Perform engineering measurements
	MEM18001	Use hand tools
	MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine job requirements	1.1 Follow standard operating procedures (SOPs)
	1.2 Comply with work health and safety (WHS) requirements at all times
	1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
	1.4 Identify job requirements from specifications, drawings, job sheets or work instructions
2. Troubleshoot electronic equipment	2.1 Determine the function of electronic equipment by reference to circuit diagrams, equipment manuals and/or consultation with equipment operator, where appropriate
	2.2 Run equipment built-in test functions and record results, where appropriate
	2.3 Note and record built-in faults/status display
	2.4 Apply diagnostic techniques to locate faults in electronic equipment, including the use of specialist test equipment
	2.5 Isolate and remove faulty card or sub-assembly from electronic system using appropriate tools and techniques
	2.6 Source replacement item and replace in accordance with manufacturer specifications
3. Return electronic equipment to service	3.1 Adjust/tune or calibrate electronic equipment for conformance to specifications, where appropriate
	3.2 Test repaired equipment/sub-assemblies for compliance to specifications and/or manufacturer requirements
	3.3 Complete all documentation requirements according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Electronic equipment includes one or more of the following:	• amplifiers • analog/digital hardware • telecommunication • consumer audio/video • electronic appliances • process control • computer systems • security monitoring and alarm systems • scanning systems • fire systems • power supplies • test equipment
Fault-finding techniques include one or more of the following:	• signal injection • substitution • monitoring • measurement • visual
Test equipment includes one or more of the following:	• continuity testers • ammeters • voltmeters • cathode ray oscilloscopes (CROs) • frequency counters • signal generators • digital probes

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Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18108 Troubleshoot analog and digital electronic equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, SOPs and safe work practices
- identifying and interpreting circuit diagrams, specifications, schematics, maintenance records, drawings, supplier catalogues and obtaining relevant data with respect to troubleshooting analog/digital electronic equipment
- locating, reading/recording and diagnosing built-in fault indicators and obtaining error code interpretation documents and run test functions and recording faults and/or equipment status indicated by built-in functions/display
- applying diagnostic techniques in fault-finding electronic equipment down to sub-assembly and/or plug-in card level
- isolating and removing faulty item and selecting replacement item from appropriate sources
- adjusting/tuning and calibrating in accordance with specifications
- verifying repaired electronic equipment for compliance to specifications
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- function(s) and operational specifications of the electronic equipment/sub-assembly and electrical principles associated with electronic sub-assemblies
- implications of electro-static discharge (ESD) upon the electronic equipment
- procedures for running built-in test functions and recording identified faults
- equipment and techniques to be used to test the electronic equipment, including the use of specialised test equipment
- diagnostic techniques, including:
  - visual inspection
  - signal injection

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  - half-split rule and component isolation
- procedures for running built-in test functions and recording faults identified
- errors indicated by built-in devices
- procedures for isolating electronic equipment/sub-assemblies
- tools and techniques to be used to remove/replace components from/into electronic equipment
- procedures and techniques for adjusting/tuning and calibrating electronic equipment/sub-assemblies
- test procedures and specifications for returning repaired equipment/sub-assemblies to service.

Assessment Conditions

Assessors must:

- have vocational competency in troubleshooting analog and digital electronic equipment at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM18109 Troubleshoot instrumentation systems and equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Application

This unit has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in fault-finding and troubleshooting techniques that are instrumental in reducing instrumentation down-time.

It covers performing functional tests under normal, extreme, overload and environmental conditions using hardware and software techniques across a wide range of instrumentation systems used in an industrial environment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: **4**

Pre-requisite Unit

Path 1	MEM12023	Perform engineering measurements
	MEM18001	Use hand tools
	MEM18104	Dismantle, replace and assemble electrical components and equipment
	MEM18108	Troubleshoot analog and digital electronic equipment

Competency Field

Maintenance and diagnostics

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2.	Prepare to troubleshoot systems and equipment	2.1	Observe and localise device isolation methods/requirements
		2.2	Apply appropriate test procedures and application principles in assessing operation of instrumentation systems and equipment
		2.3	Apply normal operating characteristics of instrumentation systems and equipment to the level necessary to identify and localise faults
		2.4	Apply characteristics/operational function assessment procedures according to safety and regulatory/site specifications
		2.5	Check and verify characteristics and operational function
3.	Troubleshoot systems and equipment and localise fault conditions	3.1	Utilise manufacturer manuals, history files and maintenance and repair records as a source of information when troubleshooting
		3.2	Utilise drawings/diagrams and operational specifications in identifying and localising fault conditions
		3.3	Examine and interpret built-in fault indicators and error codes and record results, where appropriate
		3.4	Conduct appropriate tests to establish fault condition to major component level using appropriate test equipment,

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			procedures and techniques
4.	Repair/replace faulty condition/component	4.1	Repair faulty condition using appropriate tools, equipment and techniques to meet specifications, where applicable
		4.2	Source replacement item and replace in accordance with manufacturer specifications
5.	Functionally test instrumentation equipment/components	5.1	Undertake tests on equipment/components using appropriate test equipment, procedures and techniques
		5.2	Verify system/equipment to meet specifications and operational requirements
		5.3	Document all repairs, including results of tests carried out in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tests include one or more of the following:

- determining the correct operational function of electrical, electronic, mechanical, fluid power systems, equipment, components and associated items
- tests conducted under:
  - normal
  - extreme
  - overload
  - environmental conditions using hardware and software techniques

Equipment includes one or more of the following:

- process machines
- temperature control systems
- sterilisation units
- water cooling/filtration systems
- equipment utilising mechanical, pneumatic/electro-pneumatic or electronic (analog/digital) principles
- associated instruments measuring variables, including level, pressure, light, flow, current, resistance, voltage, density and temperature

Components include one or more of the following:

- sensors
- transmitters
- converters
- indicators
- analysers
- controllers
- transducers
- power supplies
- removable circuit boards
- sensor units associated with determining/controlling density, level, flow, temperature and composition of a range of materials

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test equipment includes one or more of the following:

- system calibrators
- manometers
- dead weight testers
- wheatstone bridge
- potentiometers
- frequency/signal generators
- logic probes
- multimeters (analog/digital)
- test gauges
- cathode ray oscilloscopes (CROs)
- other associated equipment

Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM18109 Troubleshoot instrumentation systems and equipment

Modification History

Release 2. Prerequisite units updated

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, SOPs and safe work practices
- identifying and interpreting specifications, drawings, manufacturer manuals, history files and maintenance and repair records, and other applicable reference documents and obtaining relevant data with respect to troubleshooting instrumentation systems/equipment
- isolating instrumentation system/equipment in accordance with procedures
- checking and verifying the operational functions of the instrumentation system/equipment, including reading/recording and interpreting built-in fault indicators and error codes
- conducting appropriate tests to establish fault condition using applicable test equipment using hardware and software techniques
- repairing fault condition to meet specification requirements
- isolating and removing faulty major component and selecting replacement item from appropriate sources
- undertaking appropriate tests on instrumentation system/equipment in accordance with SOPs
- verifying system to meet operational requirements
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- instrumentation principles controlling density, level, flow, temperature and composition of a range of materials
- effects of resistance, capacitance, inductance and impedance (R, L, C) upon electrical circuit
- interpretation requirements of schematic, wiring and block diagrams and circuits
- principles of hydraulic, pneumatic and electrical flow
- purpose/operational function of instrumentation system

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- equipment and techniques to be used to test instrumentation systems and equipment, including the use of specialised test equipment
- procedures for running built-in test functions and recording identified faults
- functional tests to be carried out under normal, extreme, overload and environmental conditions
- specifications of each instrumentation system and acceptable deviations from specifications
- correct operation of the instrumentation system, including the procedures for isolating instrumentation systems
- range of faults in instrumentation system/equipment components
- variations between test results and operational specifications
- probable causes of faults in instrumentation system/equipment components and action to be taken to rectify the causes of faults
- sequence of events to be undertaken to correct faults in the instrumentation system/equipment components
- difference between real and potential faults
- function and procedural checks on instrumentation systems/equipment.

Assessment Conditions

Assessors must:

- have vocational competency in troubleshooting instrumentation systems and equipment at least to the level being assessed with relevant industry knowledge and experience.
- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.

Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturer specifications.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM19001 Perform jewellery metal casting

Modification History

Release 1. Supersedes and is equivalent to MEM19001B Perform jewellery metal casting

Application

This unit of competency defines the skills and knowledge required to perform jewellery metal casting using the 'lost wax' method of investment casting.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare metals for casting**	2.1	Select required metals and alloys
		2.2	Weigh out metals and alloys in correct wax-to-metal ratios
		2.3	Record data according to SOPs
3	**Conduct pre-casting operations**	3.1	Prepare equipment according to SOPs, including checking required inert gas supply, delivery and vacuum systems
		3.2	Carry out required pre-heating and glazing
		3.3	Maintain temperature of invested flask
4	**Melt jewellery metal and cast metals**	4.1	Apply protective coating, including borax, fluxes and inert gases to jewellery metal
		4.2	Heat jewellery metal to achieve casting temperature
		4.3	Position burn-out flask
		4.4	Tap molten metal, making allowance for adequate solidification time
		4.5	Operate furnace in accordance with SOPs
5	**Perform post-casting operations**	5.1	Remove casting flask and store in a safe manner
		5.2	Clean, store and dispose of casting materials and consumables

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Metals and alloys include one (1) or more of the following:	• gold • platinum • palladium • silver • copper • their alloys
Equipment includes one (1) or more of the following:	• resistance coils • induction coils • hand held torches fuelled by a variety of combinations of gas, propane, acetylene, air and oxygen
Protective coatings include one (1) or more of the following:	• borax • fluxes • inert gases

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19001B Perform jewellery metal casting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19001 Perform jewellery metal casting

Modification History

Release 1. Supersedes and is equivalent to MEM19001B Perform jewellery metal casting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings for performing jewellery metal casting
- undertaking numerical operations and calculations associated with performing jewellery metal castings
- identifying and weighing metals and their alloys appropriate to the correct wax-to-metal ratios
- setting up, checking and operating equipment
- heating metals and alloys and maintaining furnace temperatures to achieve jewellery metal casting temperature
- applying safe casting procedures working within heating timeframe constraints and tapping molten metal, making allowances for adequate solidification time
- cleaning, storing and disposing of casting materials and consumables in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- identification of precious metals and alloys
- properties of jewellery metals in relation to casting
- calculations for proportions and quantities of alloys
- data recording procedures
- consequences of poor work practices
- equipment preparation and operating procedures
- burn-out cycles and testing procedures for heat register or control device
- procedures for checking and maintaining inert gas supply and delivery seals and vacuum systems

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- melting points of various metals and alloys
- furnace start-up and shutdown procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing jewellery metal casting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19002 Prepare jewellery illustrations

Modification History

Release 1. Supersedes and is equivalent to MEM19002B Prepare jewellery illustrations

Application

This unit of competency defines the skills and knowledge required to produce illustrations for manufacture, modification or repair of jewellery items.

Where computerised storage and retrieval systems are used unit MEM16008 Interact with computing technology should also be selected.

Where a computer-aided design (CAD) system is required to be used appropriate units should also be selected.

Where interpersonal and customer/client service skills are required to be used the appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Determine job requirements from specifications, job sheets or work instructions
2	**Prepare or modify drawing**	2.1	Select tools and equipment for drawing
		2.2	Generate illustrations consistent with enterprise SOPs
		2.3	Render illustration
		2.4	Approve illustration and accompanying documentation in accordance with SOPs
		2.5	Use, store, file, copy and issue working and reference drawings and illustrations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Job specifications, job sheets or work	• stone inclusions and sizes • customer sizing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

instructions include one (1) or more of the following:	• special requests e.g. engraving • material requirements • collection arrangements • design information • customer ideas and concepts • sketches • preliminary layouts • work instructions • job packets • associated documents
Tools and equipment include one (1) or more of the following:	• compass • set square • ruler • range of graphite or colour pencils • cartridge paper • computer • software program
Accompanying documentation includes one (1) or more of the following:	• quotation • specific design information • recommendations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19002B Prepare jewellery illustrations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19002 Prepare jewellery illustrations

Modification History

Release 1. Supersedes and is equivalent to MEM19002B Prepare jewellery illustrations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications
- selecting equipment appropriate to the illustrating method and requirements and preparing or modifying drawing
- setting up and safely operating equipment
- using colour, shadow and highlight techniques for emphasis to display jewellery design concept, and rendering illustration
- approving final illustration as per design information and processing in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- workplace documentation, storage and retrieval processes
- isometric and orthographic drawing perspectives
- drawing equipment and applications, storage and maintenance
- drawing methods
- rendering applications and techniques and tools for the creation of illustration effects
- jewellery designs, including shanks, settings styles, shoulders, decorative finishes
- working properties of jewellery metals used in practical manufacturing applications.

Assessment Conditions

- Assessors must:
  - have vocational competency in preparing jewellery illustrations at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19003 Handle gem materials

Modification History

Release 1. Supersedes and is equivalent to MEM19003B Handle gem materials

Application

This unit of competency defines the skills and knowledge required to safely handle a variety of gem materials and identify the condition and features of gem materials.

Emphasis is placed on knowledge of the principles of gemmology, gemstone and diamond nomenclature, gemstone processing enhancement and repair, and appreciation of gemstone qualities.

This unit applies to an individual working autonomously in a jewellery manufacturing environment and guided by strict rules of procedure.

Note: The competencies covered by this unit do not include the requirement to perform accurate and positive gemstone identifications.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Handle gem materials**	2.1	Select tools and equipment to observe gem materials
		2.2	Observe the physical properties, techniques and results of gem materials
		2.3	Identify requirements for protection and storage of gem materials
		2.4	Handle gem materials to minimise risk of damage
3	**Record and compare general observations**	3.1	Record observations and compare with reference materials
		3.2	Interpret results

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Gem materials include one (1) or more of the following:	• natural (including diamonds) • composite • synthetic • imitation • treated
Tools and equipment include one (1) or more of the following:	• tweezers and 10x loupe • ultrasonic cleaner • measuring gauges
Techniques and results include one (1) or more of the following:	• prior enhancing treatments • imperfections • weaknesses
Reference material includes one (1) or more of the following:	• charts • lists • graphs • diagrams • other control material

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19003B Handle gem materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19003 Handle gem materials

Modification History

Release 1. Supersedes and is equivalent to MEM19003B Handle gem materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting relevant tools and equipment to handle and observe gem materials
- using gemstone measuring devices
- using a loupe
- identifying gem condition and characteristics
- comparing data with reference material.

Knowledge Evidence

Essential knowledge required to effectively handle and observe gemstone materials outlined in elements and performance criteria of this unit includes:

- safe work practices and procedures and use of personal protective equipment (PPE)
- gemstone types, including selections of all the major gemstone materials as well as composite, synthetic and imitation gemstones, and diamonds
- gemstone weaknesses and imperfections
- effects of manufacturing and repairing techniques on various gem materials
- effects of gem properties and treatments on handling
- function and limitations of selected equipment
- handling procedures for gem materials
- gemstone and diamond nomenclature.

Assessment Conditions

- Assessors must:
  - have vocational competency in handling and examining gemstone materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19004 Handle and examine gemstone materials

Modification History

Release 1. Supersedes and is equivalent to MEM19004B Handle and examine gemstone materials

Application

This unit of competency defines the skills and knowledge required to safely handle a variety of gem materials and examine gems to determine physical and chemical properties.

Emphasis is placed on knowledge of the principles of gemmology, gemstone and diamond nomenclature, gemstone processing enhancement and repair, and appreciation of gemstone qualities.

This unit applies to an individual working autonomously in a jewellery manufacturing environment and guided by strict rules of procedure.

Note: The competencies covered by this unit do not include the requirement to perform accurate and positive gemstone identifications.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM19003	Handle gem materials

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Perform gemstone examinations and handle gem materials**	2.1	Select examination methods and equipment appropriate to the gem material and examination requirements
		2.2	Prepare equipment and specimen
		2.3	Apply handling measures appropriate to gem material
		2.4	Identify the physical and optical properties of gem materials
		2.5	Record and verify examination results
		2.6	Prepare examination results and record conclusions with supportive evidence

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Gem materials include one (1) or more of the following:	• natural (including diamonds) • composite • synthetic • imitation • treated
Equipment includes one (1) or more of the following:	• 10x loupe tweezers • refractometer • UV light • microscope • thermal probes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19004B Handle and examine gemstone materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19004 Handle and examine gemstone materials

Modification History

Release 1. Supersedes and is equivalent to MEM19004B Handle and examine gemstone materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting relevant tools and equipment to handle and examine gem materials
- setting up and safely operating equipment, including preparing, pre-setting, balancing, calibrating and levelling of equipment, for examination of gem materials
- undertaking numerical operations and calculations associated with handling and examining gem stones
- identifying relevant physical and optical properties of gemstones
- recording results and comparing results with known control items, charts, lists, graphs, diagrams and resource materials
- reading valuation documents, making comparisons and verifying outcomes
- selecting and applying handling measures and precautions in relation to gem materials, work processes, tools and equipment
- investigating and reporting examination results, including assessing need for further examination, cross referencing other records and cross referencing valuation documents.

Knowledge Evidence

Essential knowledge required to effectively handle and examine gemstone materials outlined in elements and performance criteria of this unit includes:

- safe work practices and procedures and use of personal protective equipment (PPE)
- examination methods for gem materials in relation to the properties and features that may affect specific materials during jewellery manufacture, repair or alteration
- equipment required for examination and the function of each
- limitations of the selected equipment and methods
- SOPs for selected equipment
- definitions of processes and features
- physical and optical properties and qualities of relevant gemstones
- principles of gemmology

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- gemstone and diamond nomenclature
- process for verifying results
- handling measures and precautions for specific gem materials during jewellery manufacture, repair or alteration
- evidence used in support of conclusions.

Assessment Conditions

- Assessors must:
  - have vocational competency in handing and examining gemstone materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19005 Produce three-dimensional precision items

Modification History

Release 1. Supersedes and is equivalent to MEM19005B Produce three-dimensional precision items

Application

This unit of competency defines the skills and knowledge required to produce one-off, three-dimensional handmade precision jewellery items using a range of metals and techniques common to industry practice.

Where soldering is required to be used unit MEM05006 Perform brazing and/or silver soldering should also be selected.

Where lathes are required to be used unit MEM07005 Perform general machining should also be selected.

Where production of three-dimensional precision jewellery masters is required unit MEM19013 Produce jewellery metal masters should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for production**	2.1	Select process and technique for production of item
		2.2	Select item materials, tools and equipment
3	**Produce one-off item**	3.1	Develop construction plan to meet specifications and stages of process
		3.2	Prepare item components using appropriate techniques and procedures
		3.3	Produce and assemble item
4	**Finish and inspect work**	4.1	Check item for compliance with specifications and make repairs/adjustments as required
		4.2	Record product data using appropriate documentation

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Apply final finish and storage procedure

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Items include one (1) or more of the following:	• rings • broaches • bracelets • neckpieces • pendants • earrings • other decorative pieces
Materials include one (1) or more of the following:	• precious and non-precious metals • solders and fluxes • drills and blades • polishing compounds • cleaning and finishing materials • adhesives
Tools and equipment include the following:	• all hand and power tools appropriate to construction and repair of jewellery items • PPE

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate preparation and fabrication techniques include one (1) or more of the following:	• cutting • folding • bending • curving • dapping • drawing • rolling • doming • annealing • melting • granulation • brazing • silver soldering • riveting
Documentation includes one (1) or more of the following:	• work instructions • SOPs • reference material for parts and components • records of materials and consumables used • time and record sheets • drawings and illustrations • customer verbal and written specifications
Final finish includes one (1) or more of the following:	• filing • emery finishing • high and satin polish • embellishment finishes (sandblasting, brushed, burring, reticulation and burnishing) • electroplating

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19005B Produce three-dimensional precision items

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Assessment Requirements for MEM19005 Produce three-dimensional precision items

Modification History

Release 1. Supersedes and is equivalent to MEM19005B Produce three-dimensional precision items

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, job sheets or work instructions to produce three-dimensional items
- selecting materials to meet design specifications
- selecting tools and equipment, including all hand and power tools appropriate to construction and repair of jewellery items
- applying appropriate fabrication procedures
- applying final finish to design item in accordance with design specifications
- completing documentation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- reasons for selecting particular metals, construction methods, manufacturing and finishing techniques
- tools and equipment required for processes
- planning and process stages
- working properties of precious and non-precious metals
- fine detail manufacturing processes
- components of jewellery items
- types and uses of measuring devices and recording methods
- procedures for final treatment, safe handling and storage of items.

Assessment Conditions

- Assessors must:

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  - have vocational competency in producing three-dimensional precision items at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19006 Replace watch batteries

Modification History

Release 1. Supersedes and is equivalent to MEM19006B Replace watch batteries

Application

This unit of competency defines the skills and knowledge required to replace digital or analog watch batteries and arrange water resistance and pressure testing.

Some knowledge of watch glasses and seals is required, however specific replacement functions for these are not covered by this unit and testing functions relate only to the measurement of voltage, consumption and resistance.

This unit does not apply to diver and other water-resistant watch types and water resistance and pressure testing is not covered by this unit, however identification of watches requiring testing as well as procedures for arranging testing are a requirement of this unit.

Where power cell replacements in these two categories are of common practice with associated testing and/or identification/cleaning/supply/fitting of waterproofing/water resistance components appropriate horological units should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify watch construction**	2.1	Identify case material and construction
		2.2	Identify case types and their function
		2.3	Identify associated parts and consumables
3	**Open and close watches**	3.1	Select and use workshop tools and equipment
		3.2	Open and close watch cases
		3.3	Inspect parts and report or record results
4	**Select and replace batteries**	4.1	Perform general inspection of surface areas
		4.2	Select battery and install
		4.3	Measure voltage, consumption and resistance
		4.4	Handle and store batteries according to SOPs
5	**Arrange water**	5.1	Identify watches requiring water resistance or pressure testing

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
resistance and pressure testing	5.2 Arrange water resistance and pressure testing

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19006B Replace watch batteries

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19006 Replace watch batteries

Modification History

Release 1. Supersedes and is equivalent to MEM19006B Replace watch batteries

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, job sheets or work instructions to replace watch batteries in digital and analog watches
- selecting and using appropriate tools and equipment, including all hand and power tools appropriate to opening and closing watch cases
- handling and cleaning case, movement and other watch parts and inspecting for obvious damage, wear and moisture intrusion
- inserting and removing batteries
- measuring voltage, resistance and consumption for correct values in accordance with manufacturers' data
- arranging water resistance and pressure testing.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- applicable horological terminology
- design of case types, including water resistant, dustproof and diver's, and their functions
- types of batteries and their functions and battery cell construction
- analog, digital, multi-function and mechanical watch functions
- wear and the possible effects on glass and adjustors
- watch-specific tools and equipment
- manufacturers' information, specifications and SOPs
- location and cause of moisture and corrosion effects
- handling, cleaning and adjustment procedures
- work health and safety (WHS) issues for mercury and lithium batteries
- appropriate symbols and other identifying relevant standards information and their location

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- battery features, identification codes and parts associated with battery function
- procedures to confirm battery status
- relevant internal and external water resistance and pressure testing bodies or personnel
- arrangements and procedures for dispatch and receipt of watches.

Assessment Conditions

- Assessors must:
  - have vocational competency in replacing watch batteries at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19007 Perform gemstone setting

Modification History

Release 1. Supersedes and is equivalent to MEM19007B Perform gemstone setting

Application

This unit of competency defines the skills and knowledge required to perform manual setting of gemstones in a range of metals and design styles.

The unit is not intended to cover the work of a specialist gemstone setter and do not select this unit for the setting of stones into wax, rubber and resin.

Where production setting is required unit MEM07024 Operate and monitor machine and process should also be selected.

Where annealing and tempering is required unit MEM19005 Produce three-dimensional precision items should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work

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MEM19003 Handle gem materials

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials and equipment and perform gemstone setting**	2.1	Identify metal and setting requirements
		2.2	Assess gemstone status
		2.3	Select, prepare and maintain tools to achieve desired outcome
		2.4	Prepare metal for setting
		2.5	Handle and secure gemstones in a correct manner
		2.6	Ensure setting metal is finished and burnished to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools include one (1) or more of the following:	• holding and securing devices • pliers • burrs • scaupers • burnishers • emery • beaders • electronic tools • mechanical tools
Setting styles include one or more of the following:	• claw • grain • rub-over

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19007B Perform gemstone setting

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19007 Perform gemstone setting

Modification History

Release 1. Supersedes and is equivalent to MEM19007B Perform gemstone setting

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, job sheets or work instructions to identify gemstone features and setting requirements, including the type of setting and specific product handling measures
- selecting and using tools to prepare metals for setting and securing gemstones to achieve desired outcome in accordance with specifications
- adjusting, sharpening and maintaining tools to achieve optimum performance.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- setting processes and terminology
- gemstone features and handling procedures
- suitability of metal for carving and setting
- maintenance requirements of tools
- setting techniques, processes and procedures
- working properties of materials.

Assessment Conditions

- Assessors must:
  - have vocational competency in preforming gemstone setting at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19008 Prepare jewellery designs

Modification History

Release 1. Supersedes and is equivalent to MEM19008B Prepare jewellery designs

Application

This unit of competency defines the skills and knowledge required to prepare designs and associated documentation required to inform manufacture of jewellery items.

Where computer-aided design (CAD) is required to be used appropriate units should also be selected.

Where jewellery illustrations only are prepared unit MEM19002 Prepare jewellery illustrations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, design documentation, illustrations, design drawings, job sheets or work instructions
2	**Identify design requirements**	2.1	Determine design requirements, purpose and needs
		2.2	Undertake further research and idea development
		2.3	Consolidate information and analyse
		2.4	Advise customer on design considerations and limitations and gain further clarification, as necessary
3	**Develop design concept**	3.1	Develop concept, employing design principles
		3.2	Document design process
		3.3	Establish basic forms and proportion
		3.4	Apply required decorative aesthetics
		3.5	Confirm design concept
4	**Produce drawings for item manufacture**	4.1	Select appropriate manufacturing technologies
		4.2	Apply drawing techniques in drawing development
		4.3	Produce working technical and finished drawings
		4.4	Specify production requirements and instructions and communicate to appropriate persons

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Design requirements include one (1) or more of the following:	• materials • stone specifications • special requirements • size • budgetary range • end-use • special customer requirements
Design principles include one (1) or more of the following:	• correct construction techniques • construction limitations of materials • drawing to scale • form, function, harmony and line definition (interpretive and actual)
Design concept includes one (1) or more of the following:	• balance • proportion • highlights • shadowing • texturing effects • decorative aesthetics
Sources of information for jewellery design include one (1) or more of the following:	• specifications • design documentation • illustrations • design drawings • job sheets • work instructions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Decorative aesthetics include one (1) or more of the following surface finishing techniques:	• sandblasting • polishing • electroplating
Manufacturing technologies include one (1) or more of the following:	• hand-fabrication techniques • computer numerically controlled (CNC) processes • mass finishing activities
Drawing techniques include one (1) or more of the following:	• cones • cylinders • cube • rectangle • sphere • 3-D concept • axis lines • conversion of 2-D to 3-D concepts • depth • perspective • scale (1,2 and 3 point) • use of drawing media, including paper, watercolour, pastel, ink and pencil • use of drawing tools, including stencils and rubbers
Preparation of designs includes one (1) or more of the following:	• manual drawing techniques • 2-D CAD applications • 3-D CAD applications

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19008B Prepare jewellery designs

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19008 Prepare jewellery designs

Modification History

Release 1. Supersedes and is equivalent to MEM19008B Prepare jewellery designs

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting requirements from supplied information to prepare jewellery designs
- identifying and confirming the design requirements with the customer
- developing research and idea to sufficient level in order to determine customer expectations and design outcomes, and evaluating abstract and applied concepts for use in a commercial environment
- undertaking numerical operations and calculations associated with preparing jewellery designs
- applying design principles in concept development
- documenting design concept and selecting technologies suitable for manufacture of item
- producing drawings that accurately reflect design concept and specify production requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- design resources and where to locate them
- research techniques and available resources
- social trends, cultural, environmental and social context
- relevant industry literature and applicable industry standards or regulations
- existing designs, ethical and competitive considerations
- brainstorming techniques for research and idea development
- design principles
- design documentation
- form drawing development
- geometric forms and drawing techniques

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- enhancement techniques
- available manufacturing technologies and their suitability for jewellery manufacture
- types of working drawings and their uses
- interrelation between technical and design drawings
- industry requirements and availability of industry expertise.

Assessment Conditions

- Assessors must:
  - have vocational competency in preparing jewellery designs at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19009 Perform investment procedures for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19009B Perform investment procedures for lost wax casting process

Application

This unit of competency defines the skills and knowledge required to prepare investment flasks using manual and automatic equipment for jewellery casting procedures.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Plus, one or more of the following

MEM07024	Operate and monitor machine and process
MEM13003	Work safely with industrial chemicals and materials

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Invest flask**	2.1	Prepare and check materials
		2.2	Select and prepare casting methods, tools and equipment
		2.3	Assemble flask for casting
		2.4	Mix investment and prepare curing stage
3	**Operate ‘lost wax’ sequence and clean site**	3.1	Evacuate ‘low melt’ wax by steam process
		3.2	Position and store investment flask
		3.3	Select and apply 'burn-out' procedure
		3.4	Clean tools, equipment and site area

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Casting methods include one (1) or more of the following:	• centrifugal casting • vacuum casting
Tools and equipment include one (1) or more of the following:	• flasks and base • investment • scales • mixers • bowls • vacuum

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19009B Perform investment procedures for lost wax casting process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19009 Perform investment procedures for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19009B Perform investment procedures for lost wax casting process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, job sheets or work instructions in performing investment procedures for lost wax casting process
- checking pre-assembled wax for security, size and weight and selecting, checking and cleaning sprue and investment materials and recording weights
- calculating and weighing out proportions of investment material and water and selecting and assembling appropriate flask size
- performing mixing, vibrating and vacuum procedures and operating steamer and process to evaluate ‘low melt’ wax
- inspecting flasks for residue prior to burn-out, positioning, storing flask and selecting appropriate burn-out procedure and equipment, including inspecting and adjusting oven or kiln cavity
- cleaning investment equipment of residue and disposing in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for checking built wax
- casting methods and equipment and processes
- sprue and investment tools, equipment and materials
- techniques for sprue or tree styles and selection and application of the processes
- selection of flask and components for specific casting processes
- procedures and computations for mixing proportions, time calculations, volume and weights
- appropriate gloss off and set time allowance prior to base removal
- requirements for curing and set stage
- sequence and values for time, temperature and cam settings

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- steamer process
- suitability of flask and investment for burn-out
- sequence, procedures, adjustments for variables
- procedures for storage and positioning
- procedures for cleaning, storage and removal of materials and reasons for housekeeping functions
- recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing investment procedures for lost wax casting process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19010 Produce rubber moulds for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19010B Produce rubber moulds for lost wax casting process

Application

This unit of competency defines the skills and knowledge required to prepare flexible moulds for the purpose of replicating an original model.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare and pack mould frame**	2.1	Select mould frame and rubber for style of master and job requirements
		2.2	Prepare rubber and pack mould frame
3	**Cure rubber and release mould**	3.1	Select appropriate curing system
		3.2	Cure, cool and remove assembled mould
		3.3	Select tools and procedures for the release of the master pattern
		3.4	Release master pattern

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mould frame includes one (1) or more of the following:	• solid systems • component systems
Rubber includes one (1)	• silicon • natural rubber

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

or more of the following:

Curing system includes one (1) or more of the following:	• vulcaniser • room temperature vulcaniser (RTV) • standard heat and pressure combinations
Tools include one (1) or more of the following:	• scalpel • vice

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19010B Produce rubber moulds for lost wax casting process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19010 Produce rubber moulds for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19010B Produce rubber moulds for lost wax casting process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, job sheets or work instructions in producing rubber moulds for lost wax casting process
- selecting appropriate frame including various shapes and sizes, solid or component systems and preparing master frame
- cutting rubber using appropriate measurements, packing into frames and selecting variables of time, temperature and pressure for the appropriate curing system
- selecting and using appropriate tools and methods for the release of master without damage.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- SOPs
- procedures for assessing frame system
- specific master requirements
- features and working limitations of rubber, including shrinkage and transparency, and procedures for assessing rubber and master suitability and compatibility
- packing techniques for a range of situations
- methods for establishing the appropriate time, temperature and pressure settings for the selected process
- stages in the process for mould curing, removal and cooling
- application of tools
- sequence of procedures for release of master
- placement of mould and vent lines.

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Assessment Conditions

- Assessors must:
  - have vocational competency in producing rubber moulds for lost wax casting process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19011 Perform wax injection of moulds for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19011B Perform wax injection of moulds for lost wax casting process

Application

This unit of competency defines the skills and knowledge required to inject materials under pressure for investment and burn-out aspects within ‘lost wax' casting procedures.

This unit applies primarily to organic and synthetic wax injection, but can include resin and plastic materials injected under pressure for investment and burn-out aspects within 'lost wax' casting procedures.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Perform wax injection of moulds**	2.1	Select appropriate wax material according to design specification requirements
		2.2	Prepare injection tools and equipment
		2.3	Prepare moulds
		2.4	Carry out wax injection procedures
3	**Remove and inspect patterns**	3.1	Remove wax pattern without damage and inspect
		3.2	Determine the action required when inspected wax patterns are imperfect and carry out the determined action
		3.3	Store according to SOPs and secure and clean work area

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Inspection includes checking for one (1) or more of the following:	• missing elements • alignment of rubber mould • air bubbles • shrinkage • distortion
Actions to be taken for imperfect wax patterns include one (1) or more of the following:	• repair • re-work • recycle • discard

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19011B Perform wax injection of moulds for lost wax casting process

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19011 Perform wax injection of moulds for lost wax casting process

Modification History

Release 1. Supersedes and is equivalent to MEM19011B Perform wax injection of moulds for lost wax casting process

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, job sheets or work instructions to select wax type according to wax, model and cavity specifications
- conducting measurements and preparing moulds, including rectifying inappropriate mould features
- completing injection and removing duplicated wax pattern
- repairing, re-working, recycling or discarding imperfect wax patterns as required.
- checking duplicate for compliance with master and specifications and identifying irregularities.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- wax types and characteristics
- procedures for wax injection equipment and processes for the given values of time, temperature and pressure
- characteristics of moulds
- injection procedures
- minor variations and adjustments to processes and equipment situations
- undamaged wax duplicate removal techniques for a range of situations
- procedures for wax duplicate inspection
- common irregularities
- causes and remedies of imperfections
- procedures for safe cleaning, disposal and safe storage.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing wax injection of moulds for lost wax casting process at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19012 Produce jewellery wax model

Modification History

Release 1. Supersedes and is equivalent to MEM19012B Produce jewellery wax model

Application

This unit of competency defines the skills and knowledge required to produce one-off wax models.

This unit is not intended to include fine wire filigree work.

Where the use of computer aided equipment for modelling is required unit MEM09009 Create 2-D drawings using computer-aided design system and unit MEM09010 Create 3-D models using computer-aided design system, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare materials for production of wax model**	2.1	Select waxes and tools
		2.2	Cut stock materials
3	**Produce and finish wax models**	3.1	Optimise material use and production time
		3.2	Sculpt wax to specifications
		3.3	Minimise imperfections in final wax model
		3.4	Apply surface finishes
4	**Assess suitability of final wax product**	4.1	Inspect product for compliance with specifications
		4.2	Modify final product, as necessary

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Wax models include one (1) or more of the following:	• carved forms • structural forms • free-form carving
Tools include one (1) or more of the following:	• heat irons • wax guns • saws • carving tools • wax files • flaming torch
Surface finishes include one (1) or more of the following:	• fine emery • Shellite • high polishes
Stock materials include variety in one (1) or more of the following:	• colour • hardness • properties • length
Inspection includes checking one (1) or more of the following:	• tolerances • allowance for casting shrinkage • allowance for finishing processes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19012B Produce jewellery wax model

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19012 Produce jewellery wax model

Modification History

Release 1. Supersedes and is equivalent to MEM19012B Produce jewellery wax model

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, job sheets or work instructions and select appropriate method for construction of wax model for the supplied specifications
- selecting wax to suit construction method and required finish and roughing out and sculpting shapes with minimal wastage, effort and time
- fusing joints to achieve optimum strength and quality
- conducting required measurements
- applying texture finishing and inspecting and modifying product to achieve compliance with specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- factors affecting construction of wax model, including type of wax, hand tools, method of construction, final finish and weight of finished product
- variations in end product and the relationship with wax type
- techniques in controlling melting wax and knowledge of effects of toxic fumes
- tools for preparing and producing wax for specific wax types and constructions
- importance of minimising material wastage and time taken during roughing and finishing and methods to be used to produce the required outcome to specifications with minimise waste
- key features and datum points for model
- purpose and requirements for selected surface finish
- evaluation of product by weight formulation
- effects of casting shrinkage and finishing processes.

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Assessment Conditions

- Assessors must:
  - have vocational competency in producing jewellery wax model at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19013 Produce jewellery metal masters

Modification History

Release 1. Supersedes and is equivalent to MEM19013B Produce jewellery metal masters

Application

This unit of competency covers the skills and knowledge required for producing jewellery master patterns for jewellery reproduction.

Where machining is required as a major component of this manufacturing concept unit MEM07005 Perform general machining should also be selected.

Where component(s) require preparation or manufacture by numerically controlled (NC)/computer numerically controlled (CNC)/computer-aided design (CAD)/computer-aided manufacture (CAM) as an integral part of this process by the person working autonomously appropriate units should also be selected.

Where electro-deposition and/or electro-forming of metal are required unit MEM07024 Operate and monitor machine and process or unit MEM08003 Perform electroplating operations, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **4**

Pre-requisite Unit

MEM08010	Manually finish/polish materials
MEM13004	Work safely with molten metals/glass
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM19001 Perform jewellery metal casting

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Produce master**	2.1	Select technique and process to achieve quality high polish finish for masters
		2.2	Select materials, tools and equipment for task
		2.3	Mark out materials and develop construction plan to meet specifications and stages of process
		2.4	Prepare pattern materials and produce master
3	**Finish and inspect work**	3.1	Check item for compliance with specifications
		3.2	Determine the action required when item does not comply with specifications and carry out the determined action
		3.3	Record weights and measurements
		3.4	Fit sprue material, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Apply final finish to meet specifications and store item
	3.6 Evaluate master and compare to production sample

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• jewellery alloys • base metals
Tools and equipment include one (1) or more of the following:	• hand and power tools • lathes • non-CNC machines

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19013B Produce jewellery metal masters

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19013 Produce jewellery metal masters

Modification History

Release 1. Supersedes and is equivalent to MEM19013B Produce jewellery metal masters

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, job sheets or work instructions to produce jewellery metal masters
- selecting technique and process appropriate to the task
- applying a working knowledge of metals and materials
- selecting and using tools and equipment, including precision measuring equipment to produce master
- marking out materials and developing construction plan to meet specifications
- undertaking numerical operations and calculations associated with producing jewellery metal masters
- inspecting surface condition for pre-treatment and plating process
- positioning and securing sprue section and undertaking final treatments
- checking product for compliance to specification and original design concepts and evaluating master against production sample.
- taking appropriate action with non-compliant items

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of casting, moulding, shrinkage and wax injection
- location of information and specifications and clarification approval processes
- production processes used to finish reproductions
- wrought, forge, machine and cast techniques and applications
- properties, abilities, limitations and functions of materials
- planning and process stages
- difference between master and finished item specifications
- fine detail work processes

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- levels of acceptable performance and productivity outcomes
- finishing processes
- inspection and compliance checks
- appropriate actions for non-compliant items
- surface, parts and areas appropriate for post-production processes for setting, electroplating and enamelling, and for the subsequent processes of moulding and waxing
- appropriate measuring devices and recording methods and reasons for the recording of specifications
- handling and design needs associated with sprue placement
- processes of wax injection, moulding, casting, molten metal flow and solidification
- procedures for final treatment and safe handling and storage of item
- relevancy of calculations and specifications
- techniques, tools and equipment to measure machined components.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing jewellery metal masters at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19014 Perform hand engraving

Modification History

Release 1. Supersedes and is equivalent to MEM19014B Perform hand engraving

Application

This unit of competency covers the skills and knowledge required for performing basic hand engraving using hand tool applications. Work includes block and script lettering and carving techniques on mostly flat surfaces to achieve patterns in relief or intaglio.

Where the work being performed requires the item to have shaping/drilling/contour modification using power tools unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, sketches, job sheets or work instructions
2	**Select and maintain engraving equipment and accessories**	2.1	Identify sequence of procedures and select appropriate equipment
		2.2	Prepare gravers to industry standards
3	**Perform hand engraving**	3.1	Measure item and mark out for engraving
		3.2	Position work piece and hold or clamp effectively and without damage to the work piece
		3.3	Undertake work according to SOPs and industry standards

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engraving requirements include one (1) or more of the following:	• block lettering • script lettering • pictures • carvings • size requirements • style requirements
Equipment includes one (1) or more of the following:	• scorpers • gravers

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19014B Perform hand engraving

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19014 Perform hand engraving

Modification History

Release 1. Supersedes and is equivalent to MEM19014B Perform hand engraving

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying the engraving sequence and selecting the gravers, scorpers and other applicable tools required to meet specifications
- measuring and marking out using datum lines or points for engraving and positioning and holding item without damage
- completing work according to work specifications
- maintaining the engravers by machining and sharpening graver shape and cutting angles in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- engraving terminology
- sources of task-related information
- securing methods and limitations
- different gravers and scorpers and their applications
- techniques for producing and maintaining cutting edges
- equipment and techniques used for maintaining gravers
- hand engraving techniques for letters and basic pictures and carvings.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing hand engraving at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19015 Perform jewellery enamelling

Modification History

Release 1. Supersedes and is equivalent to MEM19015B Perform jewellery enamelling

Application

This unit of competency defines the skills and knowledge required to perform enamelling techniques applied to precious metals and some base metals using torch and kiln methods.

This unit does not apply to complex three-dimensional forms and plique-à-jour techniques.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare items and materials for enamelling**	2.1	Assess item materials and construction for enamelling suitability
		2.2	Select appropriate enamelling technique and materials for the required outcome
		2.3	Prepare enamels for enamelling operation
		2.4	Prepare metal surfaces for enamelling
		2.5	Carry out additional processing of item prior to enamelling
3	**Enamel jewellery items**	3.1	Set up equipment and items for firing
		3.2	Enamel items to specification and complete firing process
4	**Finish and inspect work**	4.1	Apply final finishes
		4.2	Check product for compliance to specifications
		4.3	Identify and rectify faults
		4.4	Record relevant job information

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Enamelling techniques include one (1) or more of the following:	• torch firing • kiln firing • dusting • cloisonné • basse-taille • champlevé
Items include one (1) or more of the following:	• rings • brooches • earrings • pendants • other small-scale objects
Additional processing includes one (1) or more of the following:	• stamping • engraving • saw piercing • chasing • oxidising • roller pressing

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19015B Perform jewellery enamelling

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Links

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Assessment Requirements for MEM19015 Perform jewellery enamelling

Modification History

Release 1. Supersedes and is equivalent to MEM19015B Perform jewellery enamelling

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing items for construction and enamelling requirements
- selecting enamelling technique and materials to suit job specification and design, item properties and construction
- washing and grinding enamels, including cleaning, polishing, burnishing and pre-treating and pickling metals by hand
- applying enamel to achieve required outcome and performing any additional process requirements prior to the firing process
- setting up equipment to the correct temperature and positioning items for firing using appropriate work holding devices, and monitoring and gauging stages
- removing from heat source at appropriate time to avoid over or under firing and applying final treatments and finishes, including final firing polishing, and checking item for conformance to specifications and design requirements
- identifying causes of non-conformance and rectifying faults
- recording job information in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- enamels, base metals and properties relating to enamelling, enamelling techniques, firing techniques and work holding devices, faults and common rectification methods
- factors for determining suitability for enamelling, including available enamelling compositions, firing temperatures, metal type and properties, and item construction
- different enamelling techniques and terms
- enamelling compositions and techniques and related to specific item properties and factors, such as metal type and properties, item construction and firing temperature
- enamels and forms of availability for purchase, including leaded and unleaded, opaque and transparent

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- use of enamel colour chart to determine suitable colours
- procedures for preparation of enamel powder
- techniques for washing and grinding enamels and reasons for doing so
- preparation of metal surfaces by hand cleaning, polishing, burnishing, chemical pre-treatment by acid, surface depletion methods and application to different metals
- additional processing techniques, including stamping, engraving, saw piercing, chasing, oxidising and roller pressing
- tools and equipment for processing and their uses
- methods of applying enamels, including wet packing and dry dusting
- melting temperatures of metals and enamels
- work-holding devices
- visual appearance of enamel at different stages of firing process
- counter-enamelling techniques and reasons for doing so
- cleaning and lapping processes between firing
- different finishes and methods for achieving specific effects
- masking out methods and final firing and polishing methods
- features and factors for compliance from original specifications and job requirements
- common enamelling faults, incorrect outcomes and their causes, including oxidation, staining and under or over firing
- actions to rectify faults using standard techniques and methods
- job data to be recorded and procedures to record data.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing jewellery enamelling at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM19016 Construct jewellery components

Modification History

Release 1. Supersedes and is equivalent to MEM19016B Construct jewellery components

Application

This unit of competency defines the skills and knowledge required to transfer designs and construct jewellery components or single-piece items.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Transfer designs and produce 2-D patterns**	2.1	Identify design features and requirements
		2.2	Prepare work pieces for drawing transfer
		2.3	Transfer accurate representations of component specifications onto templates or work pieces with minimal material wastage
		2.4	Produce patterns or blanks to specification
3	**Form and finish components or item**	3.1	Follow design markings to form component or item and ensure conformity to design requirements
		3.2	Select appropriate tools and equipment for forming, joining and finishing
		3.3	Join components or formed items according to specifications
		3.4	Finish components or items to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Forming methods include one (1) or more of the following:	• cutting • folding • bending • curving • dapping
Joining methods include one (1) or more of the following:	• brazing • silver soldering • riveting
Finishing processes include one (1) or more of the following:	• filing • emery finishing • basic polishing
Transfer methods include the use of one (1) or more of the following:	• direct transfer • copied to template and adhered to work piece • carbon paper tracing
Transfer tools include one (1) or more of the following:	• permanent pen • scriber • freehand • compass • dividers • chinagraph • pencil • carbon paper

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:	• compass • dividers • rules • squares • spring gauges • vernier calipers • piercing saw • files • drill press • pedestal drill • polishing equipment and compounds • ultrasonic cleaner
Metals and consumables include one (1) or more of the following:	• precious metals • non-precious metals • solders • fluxes • drills • blades • polishing compounds • cleaning materials • finishing materials • adhesives

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19016B Construct jewellery components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19016 Construct jewellery components

Modification History

Release 1. Supersedes and is equivalent to MEM19016B Construct jewellery components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting jewellery illustrations and samples to identify component type, design, material type and specifications
- identifying the forming and joining methods appropriate to the design requirements
- transferring design to work piece using appropriate methods
- selecting and using tools and equipment
- following design markings to form component or item, achieving desired symmetry, angle and shape and aligning joins
- removing excess materials by filing or emery and undertaking re-forming adjustments to achieve specifications, as necessary
- finishing component or item to specification to a fine emery finish and polishing item in accordance with SOPs
- identifying and rectifying problems/errors.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- metal types, applications and properties
- methods and tools for transferring designs
- selection and uses of blades, drills and files
- tools, techniques and methods for forming and finishing
- polishing techniques
- procedures for identification and rectification of problems/errors.

Assessment Conditions

- Assessors must:

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  - have vocational competency in constructing jewellery components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM19017 Fabricate jewellery items

Modification History

Release 1. Supersedes and is equivalent to MEM19017B Fabricate jewellery items

Application

This unit of competency defines the skills and knowledge required to use fabrication techniques to construct jewellery components, single and multiple-piece items.

Where electroplating skills are required to be used unit MEM08003 Perform electroplating operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Jewellery and horological

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for fabrication**	2.1	Assess item design characteristics, dimensions, construction, composition and finish to select appropriate preparation and fabrication techniques
		2.2	Prioritise and plan work to meet designated timeframes and specific fabrication requirements
		2.3	Select and obtain components, materials and consumables in accordance with SOPs
		2.4	Prepare metals to required quality and dimensions
		2.5	Select tools and equipment appropriate to job requirements and check for operational effectiveness
3	**Fabricate and finish jewellery item**	3.1	Perform fabrication activities using safe operating practices in accordance with SOPs
		3.2	Check item to ensure construction conforms to required specifications, quality, procedures
		3.3	Conduct surface finishing to required specifications
		3.4	Conduct embellishing and polishing to required specifications
4	**Complete work**	4.1	Package and present finished item and store according to SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.2 Complete and process documentation
	4.3 Collect and reclaim excess materials, clean work area, tools and equipment and store in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• single-piece items • multiple-piece items • clips • catches • pins
Materials and consumables include one (1) or more of the following:	• precious metals • non-precious metals • solders • fluxes • drills • blades • polishing compounds • cleaning materials • finishing materials

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Preparation techniques include one (1) or more of the following:	• alloy • cutting • drawing down • rolling
Fabrication techniques include one (1) or more of the following:	• cutting • folding • bending • curving • dapping • drawing • rolling • doming • annealing • melting • granulation • brazing • silver soldering • riveting
Finishing activities include one (1) or more of the following:	• filing • emery finishing • high polish • satin polish • sandblasting • brushing • burring • reticulation • burnishing

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19017B Fabricate jewellery items

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19017 Fabricate jewellery items

Modification History

Release 1. Supersedes and is equivalent to MEM19017B Fabricate jewellery items

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, drawings, job sheets or work instructions to fabricate jewellery items
- selecting appropriate preparation and fabrication techniques and tools
- selecting and preparing materials for fabrication
- fabricating jewellery items in accordance with SOPs and specification requirements
- finishing jewellery items in conformance with specifications
- completing workplace documentation and cleaning work space
- identifying and rectifying problems/errors.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- metals and materials for fabricating a range of jewellery items and designs
- common jewellery design features, constructions and finishes
- metal preparation and fabrication techniques to suit different design requirements
- factors affecting the selection of preparation and fabrication methods
- materials and consumables for given jewellery fabrication jobs
- properties and characteristics of applicable metals
- ratios to create required grade, quality and composition of metals
- melting temperatures and preparation methods for melting applicable metals
- types of ingot moulds and their characteristics and applications
- methods, applications, equipment types and operational requirements for rolling and drawing metals
- process for annealing metals to prevent work hardening
- procedures for checking serviceability of applicable tools and equipment
- tools, techniques and materials for embellishing and polishing

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- procedures for storage and packaging, presentation of finished items and security measures for protection of jewellery items
- procedures for identification and rectification of problems/errors.

Assessment Conditions

- Assessors must:
  - have vocational competency in fabricating jewellery items at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19018 Repair jewellery items

Modification History

Release 1. Supersedes and is equivalent to MEM19018B Repair jewellery items

Application

This unit of competency defines the skills and knowledge required to establish and complete repair requirements for a range of jewellery items.

Where an estimate or quotation for repair is required to be produced unit MSTGN3003 Estimate and cost job should also be selected.

Where setting of jewellery is required unit MEM19007 Perform gemstone setting should also be selected.

If replacement components need to be manufactured for the repair, then appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **6**

Pre-requisite Unit

MEM05006	Perform brazing and/or silver soldering
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM19001	Perform jewellery metal casting
MEM19003	Handle gem materials
MEM19016	Construct jewellery components
MEM19017	Fabricate jewellery items

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess item condition**	2.1	Identify item characteristics, construction and composition
		2.2	Assess condition of item and the nature and extent of damage in accordance with SOPs
		2.3	Obtain assessment information and advice as required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Establish repair requirements and materials**	3.1	Establish repair requirements, options and recommended actions in accordance with SOPs and factors impacting on feasibility of repair
		3.2	Convey recommended repairs and options to client and confirm required repair work
		3.3	Select appropriate repair techniques in accordance with item construction and condition
		3.4	Obtain or manufacture replacement components in accordance with SOPs
4	**Carry out repairs**	4.1	Select and prepare tools, equipment, materials and consumables for job requirements
		4.2	Identify and address unforeseen effects of the repair work and minimise evidence of the repair
		4.3	Ensure repaired item conforms to original specifications and identified customer requirements
5	**Finalise repair**	5.1	Package or present finished item and store safely
		5.2	Complete documentation of repair work
		5.3	Collect unused and excess materials and store
		5.4	Clean work area, tools and equipment and store in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Factors impacting on feasibility of repair include one (1) or more of the following:	• cost • time • feasibility • value
Repair techniques include one (1) or more of the following:	• retipping • reshank • restoration • new collets • chain repairs • fastening mechanism repairs
Unforeseen effects include one (1) or more of the following:	• effects which could be caused by previous construction and repair techniques • effects of the repair process on stones or other components
Tools and equipment include one (1) or more of the following:	• hand tools • power tools • PPE
Materials include one (1) or more of the following:	• precious metals • non-precious metals
Consumables include one (1) or more of the following:	• solders • fluxes • drills • blades • polishing compounds • cleaning materials • finishing materials • adhesives

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19018B Repair jewellery items

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19018 Repair jewellery items

Modification History

Release 1. Supersedes and is equivalent to MEM19018B Repair jewellery items

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining information and advice required to assess item and conducting condition assessment
- selecting the appropriate repair technique in accordance with item construction and identifying repair requirements
- carrying out repairs using appropriate tools and equipment
- identifying and addressing unforeseen effects and minimising evidence of repair work
- finalising the repair and documenting repair work in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- techniques and information sources available for assessing jewellery items
- limitations in capacity to repair items
- repair techniques suitable for jewellery items
- potential effects of repair work to stones and components
- reasons for selecting particular metals, construction methods, repair, manufacturing and finishing techniques.

Assessment Conditions

- Assessors must:
  - have vocational competency in repairing jewellery items at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19020 Fault find and maintain micro-mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM19020B Fault-find and maintain micro-mechanisms

Application

This unit of competency defines the skills and knowledge required to fault find and maintains micro-mechanisms, and applies to watch and clock servicing and repair work within retail and manufacturer servicing environments.

This unit does not extend to adjusting indexing system for acoustic resonator watches, chronometer escapements and chronograph mechanisms.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Dismantle and assess components**	2.1	Dismantle micro-mechanism components for inspection using techniques and principles appropriate to the task
		2.2	Assess overall condition of micro-mechanism
		2.3	Inspect physical condition and operational functioning of components and verify with appropriate persons, as necessary
		2.4	Identify faults, damage and non-serviceable components using tools, equipment and techniques appropriate to the task
3	**Carry out maintenance**	3.1	Lubricate and clean components to specification
		3.2	Assemble, replace and install components to specification
		3.3	Check components for correct operation and make required operational adjustments

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Micro-mechanisms include one (1) or more of the following:	• mechanical watches • electric watches • clocks of recent manufacture • restoration pieces • day and date systems • automatic winding systems • generating systems • alarm mechanisms • striking mechanisms • chiming mechanisms

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:

- power source
- wheel trains
- mechanical oscillating systems
- motion work
- calendar systems
- balance assembly
- bridges
- mainspring
- barrel
- winding mechanism
- canon pinion
- drive train
- shock resist system
- endshake
- sideshake
- escapement
- bearing surfaces
- electronic circuit
- power reserve

Inspection includes observations of one (1) or more of the following:

- clearances
- fits and adjustments
- functioning
- operation of systems
- performance analysis
- overall condition and damage to case
- evidence of toxic contamination, pollution, chemical waste and other contaminants

Operational adjustments include one (1) or more of the following:

- regulation
- beat
- balance amplitude
- rate
- power supply

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate persons include one (1) or more of the following:	• customers • supervisors • managers • suppliers • technical experts • colleagues
Tools and equipment include one (1) or more of the following:	• mechanical hand tools • electronic equipment to measure amplitude and rate • electronic timing equipment • diagnostic equipment and tools

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19020B Fault-find and maintain micro-mechanisms

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19020 Fault find and maintain micro-mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM19020B Fault-find and maintain micro-mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- dismantling and removing components using appropriate hand tools and reassembling components in correct sequence to required position without damage
- inspecting timepiece to check operation and determine faults, damage and unserviceable components
- cleaning and maintaining components using appropriate tools and techniques
- verifying operation of components and assemblies
- adjusting components, assemblies and mechanisms to ensure correct operation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- features, nomenclature and operation of components and assemblies
- techniques, tools and procedures for handling, dismantling, removing, assembling and installing components
- common faults and maintenance requirements for timepieces
- impact of faults and maintenance requirements on performance
- required checks and verification processes to assess condition of components
- fault-finding procedures
- typical contaminants and their effects on operation of components
- lubricants and lubrication techniques
- cleaning requirements for ensuring correct operation
- procedures and techniques for adjusting components and operational specification for components and assemblies.

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Assessment Conditions

- Assessors must:
  - have vocational competency in fault-finding and maintaining micro-mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19021 Diagnose and service micro-mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM19021B Diagnose and service micro-mechanisms

Application

This unit of competency defines the skills and knowledge required to diagnose and service micro-mechanisms of clocks and watches, including the procurement and fitting of replacement parts, adjustment and checking to achieve timekeeping and water resistance of completed timepieces to specification.

Where the manufacturing of parts is required appropriate machining units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM19020	Fault find and maintain micro-mechanisms

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Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify performance requirements for servicing**	2.1	Identify features and performance characteristics of micro-mechanism
		2.2	Identify performance problems common to make and model
3	**Diagnose faults and servicing requirements**	3.1	Assess overall condition of micro-mechanism
		3.2	Inspect and check physical condition and operational functioning of components and verify with appropriate persons, as required
		3.3	Diagnose performance problems and establish servicing requirements
		3.4	Source replacement parts according to SOPs
		3.5	Determine overall repair costs for servicing
4	**Service micro-mechanism**	4.1	Refinish and replace components, as required
		4.2	Assemble components and lubricate to specification

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
s	4.3 Finish components and adjust to specification

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Micro-mechanisms include one (1) or more of the following:	• mechanical watches and clocks • electric watches and clocks • pieces of recent manufacture • restoration pieces • day and date systems • automatic winding systems • generating systems • alarm mechanisms • striking and chiming mechanisms • calendar mechanisms
Components include one (1) or more of the following:	• power source • wheel trains • mechanical oscillating systems • motion work • calendar systems • casing components • pivots

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Checks include one (1) or more of the following:

- tensioning
- functioning
- cleanliness
- clearances
- tolerances
- wear
- damage
- water resistance

Inspection includes observations of one (1) or more of the following:

- clearances
- fits and adjustments
- functioning
- systems and performance analysis
- materials
- design
- finish
- movement type
- typical performance problems
- special servicing requirements
- assemblies
- subassemblies
- escapement
- wheel train
- motion work
- power source (mainspring)
- calendar
- winding and setting mechanisms

Faults and damage include one (1) or more of the following:

- wear
- broken parts
- fatigue
- knocking
- contaminants
- rust

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate persons include one (1) or more of the following:

- customers
- supervisors
- managers
- suppliers
- technical experts
- colleagues

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19021B Diagnose and service micro-mechanisms

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19021 Diagnose and service micro-mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM19021B Diagnose and service micro-mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- inspecting feature and performance characteristics for given mechanism
- performing checks and verifying functioning of mechanisms, including identifying faults affecting performance
- identifying missing and damaged components and determining remedial action
- sourcing replacement parts using parts and movement catalogues
- determining sequence required for servicing with reference to available parts, design of product and nature of servicing requirement
- determining the overall repair costs, including provision for replacement of parts
- cleaning and refinishing components and selecting and applying lubricant according to on materials used and torque requirements
- evaluating water resistance of completed watch and adjusting timekeeping to tolerance.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- methods for identifying performance characteristics
- reasons for specific performance problems and faults
- faults in design or materials and special servicing requirements
- general condition features, including obvious damage
- interchangeability of parts for specific timepiece
- factors affecting sequence and process for servicing
- techniques, tools and diagnostic equipment for diagnosing and identifying performance problems
- techniques for dismantling assemblies and subassemblies
- operation of equipment for refinishing pivot and bearing replacement

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- techniques and procedures for assembling components, assemblies and subassemblies
- applications and use of different lubricants
- correct alignment of hands relating to date change mechanism and dial graduations
- adjusting timekeeping.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and servicing micro-mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM19022 Perform precision micro-mechanism diagnosis and servicing

Modification History

Release 1. Supersedes and is equivalent to MEM19022B Perform precision micro-mechanism diagnosis and servicing

Application

This unit of competency defines the skills and knowledge required to diagnose and service precision micro-mechanisms, including chronometer watch and clock components, to achieve performance to original specifications. It includes precision adjustment and testing to achieve timekeeping and water resistance specifications of completed timepieces.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18055	Dismantle, replace and assemble engineering components

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MEM19020	Fault find and maintain micro-mechanisms
MEM19021	Diagnose and service micro-mechanisms

Competency Field

Jewellery and horological

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Adjust timing of precision micro-mechanisms**	2.1	Analyse and interpret data for precision timing of micro-mechanisms
		2.2	Make adjustments to achieve a constant rate to specifications
3	**Diagnose precision micro-mechanisms**	3.1	Select and use required high tolerance and precision tools and equipment
		3.2	Apply detailed inspection and testing techniques to diagnose and identify performance faults, condition and repair or servicing requirements
4	**Carry out precision**	4.1	Remove precision components and service and replace, as appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	micro-mechanism servicing	4.2	Adjust components to precision tolerances and specifications
5	**Repair and adjust chronograph mechanisms**	5.1	Adjust functional elements and test to ensure specifications are achieved
		5.2	Examine chronograph components and re-finish, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Micro-mechanisms include one (1) or more of the following:

- mechanical watches and clocks
- electric watches and clocks
- pieces of recent manufacture
- restoration pieces
- chronometer timepieces
- day and date systems
- automatic winding systems
- generating systems
- alarm mechanisms
- striking and chiming mechanisms
- calendar mechanisms
- balance spring
- dynamic poising
- static poising
- truing balance (flat and round)
- chronograph mechanisms

Assembly and subassembly components include one (1) or more of the following:

- balance staff
- pallet staff
- pallet jewels
- wheel trains
- power source
- mechanical oscillating systems
- motion work
- calendar systems
- escapement
- balance spring

Tools and equipment include one (1) or more of the following:

- mechanical hand tools
- electronic equipment to measure amplitude and rate
- electronic timing equipment
- diagnostic equipment and tools
- high-tolerance testing equipment
- specialist service tools for adjusting oscillating systems and chronograph mechanisms

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Precision components include one (1) or more of the following:	• timekeeping elements, including:
	  • balance staff
	  • pallet staff
	  • pallet jewels
	  • wheel trains
	• power source
	• mechanical oscillating systems
	• motion work
	• calendar systems

Inspections include one (1) or more of the following:	• high-tolerance clearances • fits and adjustments • functioning • systems analysis • performance analysis

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM19022B Perform precision micro-mechanism diagnosis and servicing

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM19022 Perform precision micro-mechanism diagnosis and servicing

Modification History

Release 1. Supersedes and is equivalent to MEM19022B Perform precision micro-mechanism diagnosis and servicing

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- eliminating or minimising effects of internal and external influences and adjusting timing of micro-mechanisms
- making detailed observations using high magnification optics
- testing functioning of components to high tolerances, including functioning of escapement and oscillating system
- using appropriate tools and equipment for detailed observation diagnosis and servicing
- removing and replacing assembly and subassembly components and other precision components
- making adjustments to minimise error of performance
- repairing and adjusting chronograph mechanisms, including tensioning chronograph wheel and minute wheel, to ensure correct operation of seconds, minute and hour recording systems
- observing and adjusting depth of engagement and operating sequence of functioning elements
- applying lubricant, as required
- re-finishing and matching components to existing components to ensure correct functioning, including alignment of hands with dials
- fitting and adjusting new and repaired components to function within existing system
- determining influences in design, internal and external influences on rating variation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- physical limitations and condition of system and control factors influencing isochronism
- inherent influences in design, internal and external influences on rating variation
- adjustment procedures and techniques

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- detailed inspection and analysis techniques for diagnosing precision micro-mechanisms
- acceptable tolerances, clearances and limits for precision components
- components suitable for precision outcomes
- effects of adjustment on performance and operation
- criteria for correct adjustment of balance spring and regulating system
- types of chronograph mechanisms and their functioning
- adjustment procedures for chronograph operation, including minute and hour recording systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing precision micro-mechanism diagnosis and servicing at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20001 Produce keys

Modification History

Release 1. Supersedes and is equivalent to MEM20001A Produce keys

Application

This unit of competency defines the skills and knowledge required to produce and duplicate keys for mechanical locking devices and systems. It applies to the production of keys across a range of locksmithing areas, including automotive, domestic, commercial, security containers and ancillaries.

Where other programming of high-security transponders is required unit MEM20013 Service automotive transponder systems should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine job requirements from specifications, drawings, work instructions or existing samples
		1.5	Select appropriate method for cutting/duplicating according to key type and system, and other applicable factors
		1.6	Confirm signatories, as required
2	**Prepare materials and equipment**	2.1	Select appropriate tools and equipment
		2.2	Select correct key blank for the given application
		2.3	Set up equipment and accessories in an appropriate manner for cutting/duplicating
3	**Produce and duplicate keys**	3.1	Ensure key fits and operates lock in a correct manner
		3.2	Ensure key dimensions meet manufacturer specifications
		3.3	Use hand tools and equipment safely and in accordance with SOPs
		3.4	Finish key according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Method for cutting/duplicating includes one (1) or more of the following:

- hand
- machine
- computer and book code equipment
- programming of read/write transponders

Key types include one (1) or more of the following:

- inline pin tumbler
- single and double sided wafer
- 2 and 4 track
- lever:
  - pin
  - pipe
  - mortice
  - flat steel
  - double bitted
- warded
- pre-cut
- rotating pin
- rotating disc
- axial pin (dimple)
- tubular
- cruciform

Key systems include one (1) or more of the following:

- restricted, semi-restricted and non-restricted system numbers
- manufacturer restricted
- factory restricted
- locksmith restricted/managed
- association restricted

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements for key production includes one (1) or more of the following:	• specific client requirements and quantities • completion times and dates • job requirements and tasks • signature authorities • WHS requirements • company requirements • compliance with relevant manufacturer requirements • warranties and service information
Tools and equipment include one (1) or more of the following:	• manual and computerised code machines • milling machines, tubular machines and duplicating machines • crimpers, hand files and bridge support • measuring equipment, including standard gauges and vernier callipers

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20001A Produce keys

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20001 Produce keys

Modification History

Release 1. Supersedes and is equivalent to MEM20001A Produce keys

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting conversion charts, reference books and samples to identify blank requirements for keys used across a wide range of industries
- selecting appropriate cutting/duplicating method for key type and system
- measuring key dimensions and identifying key type appropriate to the task
- setting up and safely using cutting and duplicating equipment to produce keys
- testing and adjusting key operation, checking calibration and finishing keys.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- different techniques for cutting and duplicating
- tools and equipment for hand and machine key cutting
- key systems and blanks
- spacings, depths, angles, shapes and other measurements relevant to cutting keys
- terminology for key production
- requirements of key restrictions
- workplace method for confirming signatory to key order
- key blank storage and classification systems
- identification marking procedures
- key storage and packaging procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing keys at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20002 Assemble and test lock mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM20002A Assemble and test lock mechanisms

Application

This unit of competency defines the skills and knowledge required to assemble and test lock mechanisms. Mechanisms are essentially manual in nature and may be built to order, low volume or complex assemblies.

This unit applies to assembly of cylinders within a masterkey system or to individually keyed cylinders and requires application of locksmithing principles and practices.

Where the selection and use of engineering measuring equipment is required unit MEM12023 Perform engineering measurements or unit MEM12003 Perform precision mechanical measurement should also be selected as appropriate.

No licensing, licensing or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM20001	Produce keys

Competency Field

Locksmithing

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine job requirements from specifications, drawings, job sheets or work instructions
		1.5	Obtain appropriate authorisation, check signatures and confirm order
		1.6	Plan appropriate assembly sequence/method in accordance with specifications and SOPs
2	**Prepare to assemble lock mechanisms**	2.1	Disassemble lock mechanisms, as necessary
		2.2	Compile components and parts in accordance with assembly specifications
		2.3	Select tools, equipment and materials to suit job requirements
		2.4	Prepare work area and arrange components in accordance with SOPs and selected assembly technique
		2.5	Identify defective or faulty parts and process according to SOPs
3	**Assemble lock mechanisms and decode assembled mechanisms**	3.1	Apply locksmithing techniques and principles appropriate to assembly activity
		3.2	Maintain records or process in accordance with SOPs
		3.3	Fit component parts to ensure correct positioning and conformance with specifications
		3.4	Mark/tag/identify locking mechanism as appropriate in accordance with SOPs

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.5	Handle and store components and/or assembly in a manner least likely to cause damage and in accordance with SOPs
	3.6	Identify the lock mechanism using appropriate method
	3.7	Decode lock mechanism (internal locking components)
4 **Check finished products and mark, package and label products**	4.1	Check operation of the lock mechanism and key for conformance to specifications
	4.2	Identify and rectify faults in lock mechanism or key operation
	4.3	Select stamping equipment and stamp products with correct door and key reference information in accordance with SOPs
	4.4	Group, package and label products for installation in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Assembly specifications include one (1) or more of the following:	• required components and parts • door handing • timeframe for completion • keying instructions • fitting requirements
Documentation includes one (1) or more of the following:	• door and key schedules • job sheet • pinning charts • hardware charts • manufacturer documentation • manufacturer warranties
Lock mechanisms include one (1) or more of the following:	• pin and disc tumbler cylinders • wafer tumbler cylinders • lever and warded locks • rotating pin • rotating disc • axial pin (tubular) • radial pin (dimple) • cruciform
Components and parts include one 91) or more of the following:	• wafers • pins • discs • levers • springs • key blanks • barrels • cylinder housings • cams and screws • circlips and tails

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:	• jigs • followers • tweezers • screwdrivers • circlip pliers • files • wire wheel

Materials include one (1) or more of the following:	• graphite:
	  • powder
	  • based lubricants
	• Teflon
	• silicone based lubricants

Reference information includes one (1) or more of the following:	• system member • rank • key issue • dealer identification

Stamping equipment includes one (1) or more of the following:	• dedicated marking machine:
	  • stamp
	  • engrave
	• hand stamps
	• stamping block

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20002A Assemble and test lock mechanisms

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20002 Assemble and test lock mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM20002A Assemble and test lock mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining appropriate authorisation, checking signatures and confirming order
- planning the assembly sequence/method in accordance with specifications and SOPs
- checking components/parts against key schedule and job instructions
- assembling lock mechanisms and checking key operates the lock
- using tools and equipment to assemble lock mechanisms
- marking products with correct door and reference information using appropriate stamping equipment
- identifying and rectifying faults in lock mechanism or key operation
- grouping, packaging and labelling products and completing and processing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of mechanical locking devices
- information on handwritten and computer-generated pinning charts, key and door schedules, hardware chart, mechanical locking devices, mechanisms and components
- importance of obtaining authorisations
- difference between levers
- difference between key blanks
- fitting requirements and sequence of assembly
- tools, equipment and materials for assembling lock mechanisms
- door and key reference information and stamping methods.

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Assessment Conditions

- Assessors must:
  - have vocational competency in assembling and testing lock mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20003 Install and upgrade locks and hardware

Modification History

Release 1. Supersedes and is equivalent to MEM20003A Install and upgrade locks and hardware

Application

This unit of competency defines the skills and knowledge required to install and upgrade locks/locking systems and lock furniture, including providing advice on installation and upgrade requirements and instructing clients on the use of the product. It applies across commercial, industrial and domestic applications and work would mainly be carried out off-site.

Where fitting of door control devices is required unit MEM20005 Install and maintain door control devices/systems should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Locksmithing

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Determine job requirements from specifications, drawings, job sheets or work instructions
		1.4	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.5	Advise customer of products, product options and possible upgrade options in accordance with SOPs and customer requirements
		1.6	Establish installation procedure in accordance with work order and with minimal disruption to customer, services or normal work routines
2	**Organise and prepare installation**	2.1	Select and obtain appropriate and serviceable tools, equipment, and materials in accordance with SOPs and fitting requirements
		2.2	Establish access to site and specific site requirements, and make appropriate arrangements in accordance with client and organisational requirements
		2.3	Establish and maintain a safe worksite in accordance with legislative and organisational requirements
3	**Install and upgrade locks and hardware**	3.1	Prepare installation location, measure and mark out, as appropriate
		3.2	Fit locks and hardware in accordance with manufacturer specifications and SOPs
		3.3	Check lock and hardware for correct functioning and rectify operational problems
		3.4	Carry out work using safe work procedures and practices and in accordance with applicable legislation, codes,

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		regulations and standards
	3.5	Identify problems affecting the installation and discuss and resolve variations with appropriate persons
4 **Complete the installation**	4.1	Ensure work site is cleaned and left in presentable condition in accordance with original presentation, client requirements, industry standards and SOPs
	4.2	Undertake final inspections and rectify non-conformance to ensure installation conforms to industry, legislative and order requirements
	4.3	Notify client of job completion and obtain client acceptance in accordance with SOPs
	4.4	Instruct client on use of product in accordance with SOPs and manufacturer specifications
	4.5	Complete relevant documentation and process in accordance with industry, legislative and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer requirements include one (1) or more of the following:	• product type, function and capabilities • access issues, installation locations and positions • upgrade information • service and maintenance requirements • product operation • warranty information • costs
Organisational requirements include one (1) or more of the following:	• quality assurance standards and procedures • service standards • safety and WHS practices and obligations • resource storage and use • organisational processes and procedures • documentation processes • product and process training
Tools, equipment and other materials include one (1) or more of the following:	• hand tools • power tools and accessories • fixing tools • special-purpose equipment • lubricants, adhesives and sealants • cleaning materials • wire and cable • vacuum • drop sheet • door, window and frame materials • morticers • routers • jigs • cherry centre

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:

- night hats
- safety barriers
- face shields
- dust masks and respirators
- goggles and safety glasses
- earmuffs and ear plugs
- high visibility vests/work wear
- hard hats and head protection
- gloves
- knee pads
- safety foot wear
- warning signs and tapes
- fire extinguisher
- first aid kit

Locks and hardware include one (1) or more of the following:

- cylinder night latches and deadlocks
- lever and cylinder mortice locks
- tubular deadbolts
- key in knob and key in lever
- tie bolts
- combination sets
- mechanical digital locks
- drawer and cam locks
- door protective plates
- door control devices
- exit devices
- lockable bolts
- door viewers
- window locks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Access and installation factors and potential issues include one (1) or more of the following:	• site safety issues • out-of-hours access • disruption to client work routines • installation environment • building codes • breakdowns • environmental conditions • physical, time and cost restrictions • product supply problems
Documentation includes one (1) or more of the following:	• installation details • costings • materials used • records of faults and damage • installation problems and factors • testing and inspection results

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20003A Install and upgrade locks and hardware

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20003 Install and upgrade locks and hardware

Modification History

Release 1. Supersedes and is equivalent to MEM20003A Install and upgrade locks and hardware

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- communication with clients as required throughout the installation/upgrading process
- establishing access and maintaining safe worksite
- identifying existing fixtures and fittings, including type and quality of construction, and establishing customer requirements for installing and upgrading locks and hardware
- measuring and marking out with tape measures, rules, squares and templates in an accurate manner
- selecting and safely using appropriate tools for the type of products, materials and conditions whilst identifying and assessing hazards associated with installing locks and hardware
- identifying problems affecting the installation and discussing and resolving variations with appropriate persons
- assessing potential for unforeseen problems and incidents to affect the installation and testing and confirming the function of locks and hardware to meet customer requirements
- cleaning worksite in accordance with original presentation, client requirements, industry standards and SOPs
- completing and processing all documentation in accordance with SOPs.

Knowledge Evidence

Essential knowledge required to effectively install and upgrade locks and hardware outlined in elements and performance criteria of this unit includes:

- safe work practices and procedures and use of personal protective equipment (PPE)
- utility and application of locks, hardware and accessories
- fixtures (doors, frames and windows) and their type of construction, including foam fill, hollow, clad, steel, aluminium and other materials
- types and functions of locks, hardware and accessories to suit different fixtures and materials

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- factors for determining suitable options to meet customer requirements, including intended use, cost and compatibility with existing hardware
- installation procedures for locks, hardware and accessories
- terminology relating to lock products and installation
- tools and equipment for installing locks, hardware and lock furniture
- materials, parts and components for installation of locks and lock furniture
- applicable legislation and local regulations
- individual responsibilities and duty of care
- access and installation factors and potential issues
- procedures for measuring, marking lock and lock furniture positions and installation procedures
- effects of incorrect installation and common installation problems
- troubleshooting and lock testing methods
- strategies for resolving problems and incidents
- manufacturer specifications, uses, limitations and warranties for relevant product/s
- procedures to complete and process relevant documentation
- environmentally safe disposal procedures for packaging and other waste
- procedures and organisational requirements for final inspection and client notification and acceptance of job completion
- hazards and control measures associated with installing and upgrading locks and hardware, including housekeeping.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing and upgrading locks and hardware at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20004 Gain entry

Modification History

Release 1. Supersedes and is equivalent to MEM20004A Gain entry

Application

This unit of competency defines the skills and knowledge required to gain entry and the straightforward return-to-service of general types of commercial and domestic mechanical locks. The basis for entry includes lockout (keys inside), lost keys (rekeys) and malfunction of locks in doors and windows.

Where specialised skills are required to gain entry and to reinstate both mechanical and electronic locking systems in automotive or fire and security containers, appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms
MEM20003	Install and upgrade locks and hardware

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Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Establish entry requirements, authorisation and ownership**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Establish reason for entry, nature and urgency of problem
		1.5	Verify evidence relating to ownership and/or legal possession and authenticity of request
		1.6	Provide company and individual identifications to the customer
		1.7	Identify construction and mechanism information, including lock type, manufacturer, model, date, restrictions and limitations
		1.8	Confirm entry requirements and process with customer
2	**Gain entry to mechanical locking system**	2.1	Select appropriate tools, equipment and entry methods for the given mechanism, problem, conditions, customer and organisational requirements
		2.2	Establish a safe and secure working environment according to industry, organisational and legislative requirements
		2.3	Use selected tools to gain entry with minimal damage using appropriate industry practices
		2.4	Identify limitations and problems and seek advice or assistance as appropriate
		2.5	Replace locks and components, as necessary

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	2.6 Manufacture keys, as required
3 **Finalise and document entry process**	3.1 Check functioning of locking system and adjust as necessary for correct operation
	3.2 Identify operational problems for further service or repair
	3.3 Fit temporary or replacement lock, if necessary
	3.4 Give customer job details and recommendations for any further action according to SOPs
	3.5 Instruct customer on use of new components, if necessary
	3.6 Ensure completed documentation is accurate and process in accordance with legislative, industry and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Evidence for legal possession includes one (1) or more of the following:	• photo identification • letters of authority • proof of ownership papers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Lock types include one (1) or more of the following:

- pin tumbler (4.5.6.7 pin)
- wafer tumbler – e.g. L + F
- warded lock
- lever tumbler
- mechanical digital, exposed wheel combination
- axial pin tumbler
- radial pin tumbler
- rotating pin tumbler
- disc tumbler

Tools and equipment include one (1) or more of the following:

- specialised files and impression tools
- pick gun
- hand tools relating to gaining access
- picks, including:
  - curved, rake and hooks
  - tension wrenches (turning)
  - lever lock picks
  - tubular lock picks
- custom tools
- scope

Entry methods include one (1) or more of the following:

- pick
- impressioning
- reading
- bypass
- manipulation
- drilling

Keys include one (1) or more of the following:

- blank recognition
- keys to code
- keys to sample
- use of key machines
- use of computer code programs
- use of book codes

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Documentation includes one (1) or more of the following:	• disclaimer documents • receipt/invoice • job sheets

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20004A Gain entry

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20004 Gain entry

Modification History

Release 1. Supersedes and is equivalent to MEM20004A Gain entry

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- communicating with the customer as require throughout the process
- establishing legal possession of property prior to commencing gaining entry
- identifying construction and mechanism of the lock type and confirming entry requirements and process with the customer
- selecting and using the appropriate tools and equipment to gain access
- gaining entry with causing minimal damage and in accordance with SOPs
- reading assembly drawings and using catalogues and resources
- manufacturing keys, as required
- completing all documentation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- products and product identification
- methods of gaining access to mechanical locks
- tools and equipment for gaining access to mechanical locks
- operation and assembly of mechanical locks
- procedures to establish legal possession and legal obligations and ethical requirements
- procedures to deal with fraudulent requests
- requirements and procedures for fitting temporary locks
- hazards and control measures associated with gaining entry.

Assessment Conditions

- Assessors must:
  - have vocational competency in gaining entry at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20005 Install and maintain door control devices/systems

Modification History

Release 1. Supersedes and is equivalent to MEM20005A Install and maintain door control devices/systems

Application

This unit of competency defines the skills and knowledge required to select, install, fault find and adjust a range of door control devices and door control systems. It applies to work conducted in commercial, industrial and domestic environments.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Review work order and clarify with appropriate person(s), as required
2	**Prepare for installation and service**	2.1	Select appropriate tools, equipment and materials to meet job requirements and check for operational effectiveness in accordance with manufacturers' specification
		2.2	Identify faulty or unsafe tools and segregate for repair or replacement in accordance with SOPs
		2.3	Identify potential and existing risks and hazards associated with maintenance activities and control in accordance procedures and SOPs
3	**Install door control devices/ systems**	3.1	Select the appropriate door control device/systems for the given door type and specifications
		3.2	Install door control devices/systems in accordance with manufacturers' specifications, work order and legislative requirements and SOPs
		3.3	Check door control devices/systems for correct operation and adjust, as necessary
4	**Service door control device**	4.1	Conduct checks on door control devices/systems and components to identify any damage, friction or sticking in accordance with manufacturers' specifications
		4.2	Assess viability for continued operation or replacement

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		of door control device
	4.3	Adjust door control devices/systems and/or components in accordance with manufacturers' specifications, work order and legislative requirements and SOPs
5 **Complete installation or service**	5.1	Make notification of work completion to appropriate person(s) in accordance with SOPs
	5.2	Complete documentation and process in a prompt and accurate manner in accordance with SOPs
	5.3	Clean work area, tools and equipment and store in accordance with SOPs
	5.4	Report malfunctions, faults, wear or damage to tools for repair or replacement
	5.5	Collect waste from service and repair activities, treat and dispose or recycle in accordance with organisational and environmental requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:	• face shields, goggles and safety glasses • hearing protection • dust masks and respirators • high visibility vests or clothing • head protection • sun protection, hats and sun screen • gloves and knee pads • safety footwear • witches hats • warning signs and warning tapes • temporary safety barriers • fire extinguisher • first aid kit
Work order includes one (1) or more of the following:	• work schedules, completion dates, job requirements and tasks • specific client requirements • access to site and specific site requirements • resource requirements • WHS requirements and compliance with relevant legislation • budget allocations and warranties • service information
Appropriate person(s) includes one (1) or more of the following:	• installer • subcontractor • technician • supervisor • manager/director • client

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• solder • insulation tape • screws, springs, split pins and masonry fasteners • graphite powder and lockease • oil, silicon, dry lube and grease • adhesives • paint, patch materials • electronic components • cleaning compounds • key blanks
Tools and equipment include one (1) or more of the following:	• hand tools • fixing tools • strippers • router • file • drill and power saw • spirit level • soldering iron and welder • ladder and hoist • drop sheet • batteries • masterkey plans • PPE • communications equipment
Safe operating practices include one (1) or more of the following:	• working safely around electrical wiring, cables and overhead power lines • working safely around tools and equipment • hazard recognition, emergency procedures • awareness of electrical hazards • following confined spaces procedures • administering first aid

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Risks and hazards include one (1) or more of the following:

- non-compliance with building codes and regulations
- exposed electrical wiring
- manual handling
- exposure to asbestos, dust, noise, live power, vermin, water, glass fibre, building debris, natural and other gas build-up

Maintenance includes one (1) or more of the following:

- cleaning
- inspection
- lubrication
- routine repairs
- identification of worn parts
- confirming operation
- adjustments
- key cutting
- replacement of worn parts

Door control devices/systems include one (1) or more of the following:

- surface mounted door closers
- semi concealed door closers
- concealed closers
- semi-automatic/automatic door control devices
- exit devices

Documentation includes one (1) or more of the following:

- completion of work log
- mechanical lock/locking system problems/faults
- warranty conditions and allowances
- recommendation for repairs
- operational checks and maintenance conducted
- testing and commissioning results
- parts and components replaced
- materials used
- masterkey plans:
  - code matrix
  - key and door schedules
- recommendations for future operation and maintenance
- costings

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20005A Install and maintain door control devices/systems

Links

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Assessment Requirements for MEM20005 Install and maintain door control devices/systems

Modification History

Release 1. Supersedes and is equivalent to MEM20005A Install and maintain door control devices/systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting and following specifications, charts and diagrams and communicating in a clear and concise manner when installing and maintaining door control devices/systems
- identifying work health and safety (WHS) hazards and risks and implementing appropriate risk control measures and procedures
- selecting the appropriate tools and equipment to complete the task
- carrying out routine maintenance on door control devices/systems
- adjusting door control devices in accordance with manufacturers' and organisational requirements
- cleaning worksite in accordance with original presentation, client requirements, industry standards and SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types, functions, specifications and operational principles of door control devices/systems
- correct selection of door control devices
- common door control devices/systems faults
- maintenance requirements of door control devices/systems
- tests to confirm door control devices/systems operation
- procedures to disassemble/reassemble
- technical terminology
- types of doors and windows and mechanical system applications
- hazards and control measures associated with installing and maintaining door control devices/systems.

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Assessment Conditions

- Assessors must:
  - have vocational competency in installing and maintaining door control devices/systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM20006 Maintain and service mechanical locking devices

Modification History

Release 1. Supersedes and is equivalent to MEM20006A Maintain and service mechanical locking devices

Application

This unit of competency defines the skills and knowledge required to carry out maintenance of a range of mechanical locks and locking systems in commercial, industrial and domestic environments.

Where maintenance and servicing of safes is required unit MEM20011 Service and repair fire and security containers should also be selected.

Where maintenance and servicing of automotive locks is required unit MEM20012 Service and repair mechanical automotive locking systems and unit MEM20013 Service automotive transponder systems, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Review work order and clarify with appropriate person(s), as required
2	**Prepare for maintenance**	2.1	Identify mechanical locks/locking systems to be serviced or repaired and confirm in accordance with work order
		2.2	Select tools, equipment and materials appropriate to job requirements and check for operational effectiveness in accordance with manufacturers' specifications
		2.3	Identify faulty or unsafe tools and segregate for repair or replacement in accordance with SOPs
		2.4	Identify potential and existing risks and hazards associated with maintenance activities and control in accordance with SOPs
3	**Maintain mechanical lock/locking system**	3.1	Access mechanical locks/locking systems identified for maintenance with minimal disruption to client, services or normal work routines
		3.2	Conduct checks on mechanical locks/locking systems and components to identify any damage, friction or sticking in accordance with manufacturers' specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.3	Service mechanical locks/locking systems and components and repair in accordance with manufacturers' specifications and work order
	3.4	Identify worn keys and replace, as required, to ensure effective operational capability in accordance with work order, legislative requirements and SOPs
	3.5	Report complex faults or repair requirements outside area of responsibility or competence to appropriate person(s) for specialist advice in accordance with SOPs
4 **Complete maintenance**	4.1	Reassemble serviced and repaired mechanical locks/locking systems and check for correct operation and serviceability in accordance with manufacturers' specifications
	4.2	Make notification of work completion to appropriate person(s) in accordance with SOPs
	4.3	Complete and process documentation in a prompt and accurate manner in accordance with industry and legislative requirements and SOPs
	4.4	Clean work area, tools and equipment and store in accordance with SOPs
	4.5	Report malfunctions, faults, wear or damage to tools for repair or replacement in accordance with SOPs
	4.6	Collect waste from service and repair activities, treat and dispose or recycle in accordance with organisational and environmental requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:

- face shields, goggles and safety glasses
- hearing protection
- dust masks and respirators
- high visibility vests or clothing
- head protection
- sun protection, hats and sun screen
- gloves and knee pads
- safety footwear
- witches hats
- warning signs and warning tapes
- temporary safety barriers
- fire extinguisher
- first aid kit

Work order includes one (1) or more of the following:

- work schedules, completion dates, job requirements and tasks
- specific client requirements
- access to site and specific site requirements
- resource requirements
- WHS requirements and compliance with relevant legislation
- budget allocations and warranties
- service information

Appropriate person(s) includes one (1) or more of the following:

- installer
- subcontractor
- technician
- supervisor
- manager/director
- client

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mechanical locks/locking systems include one (1) or more of the following:	• night latches • deadlocks • lever and cylinder mortice locks • tubular deadbolts • key in knob • key in lever • tie bolts • exit devices • door control devices • lockable bolts • window locks • high security cylinders for commercial applications • exposed wheel combination locks • mechanical digital • Lockwood digital • tubular locks
Tools and equipment include one (1) or more of the following:	• hand tools • fixing tools • strippers • router • file • drill and power saw • spirit level • soldering iron and welder • ladder and hoist • drop sheet • batteries • masterkey plans • personal protective equipment • communications equipment • cleaning equipment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• solder • insulation tape • wire and cable • screws, springs, split pins and masonry fasteners • graphite powder and lockease • oil, silicon, dry lube and grease • adhesives • paint, patch materials • electronic components • cleaning compounds • key blanks
Risks and hazards include one (1) or more of the following:	• non-compliance with building codes and regulations • exposed electrical wiring • manual handling • exposure to asbestos, dust, noise, live power, vermin, water, glass fibre, building debris, natural and other gas build-up
Maintenance includes one (1) or more of the following:	• cleaning • inspection • lubrication • routine repairs • identification of worn parts • confirming operation • adjustments • key cutting • replacement of worn parts
Access includes one (1) or more of the following:	• disassembly • use of access code • disablement of system • removal of housing • access token • keys • phone line access

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Disruptions include one (1) or more of the following:	• security • time • access • noise • use of communications equipment • business operations
Safe operating practices include one (1) or more of the following:	• working safely around electrical wiring, cables and overhead power lines • working safely around tools and equipment • hazard recognition and emergency procedures • awareness of electrical hazards • following confined spaces procedures • administering first aid

Documentation includes one (1) or more of the following:	• completion of work log
	• mechanical lock/locking system problems/faults
	• warranty conditions and allowances
	• recommendation for repairs
	• operational checks and maintenance conducted testing/commissioning results
	• parts/components replaced
	• materials used
	• masterkey plans:
	  • code matrix
	  • key and door schedules
	• recommendations for future operation and maintenance
	• costings

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20006A Maintain and service mechanical locking devices

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20006 Maintain and service mechanical locking devices

Modification History

Release 1. Supersedes and is equivalent to MEM20006A Maintain and service mechanical locking devices

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting and following specifications, charts and diagrams and communicating in a clear and concise manner when maintaining and servicing mechanical locking devices
- identifying work health and safety (WHS) hazards and risks and implementing appropriate risk control measures and procedures
- selecting the appropriate tools and equipment to complete the task
- accessing mechanical locking devices to client or normal work routines
- carrying out routine maintenance on mechanical locking devices
- cleaning worksite in accordance with original presentation, client requirements, industry standards and SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types, functions and specifications and operational principles of mechanical locks/locking systems
- maintenance requirements of mechanical locks and locking systems
- common mechanical lock and locking system faults
- tests to confirm lock operation
- procedures to disassemble/reassemble mechanical locks
- technical terminology
- types of doors and windows and mechanical locking system applications
- hazards and control measures associated with maintaining and servicing mechanical locking devices.

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Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining and servicing mechanical locking devices at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20007 Plan and prepare a masterkey system

Modification History

Release 1. Supersedes and is equivalent to MEM20007A Plan and prepare a masterkey system

Application

This unit of competency defines the skills and knowledge required to create a new masterkey system for in-line pin tumbler cylinders up to and including a hierarchical great grand masterkey (GGMK) system and maisoning. It applies to manually developing a standard (even cut) progression in-line masterkey system and using a computer masterkeying package.

Where a security survey/site assessment is required unit MEM20014 Perform a site security survey should also be selected.

Where cross keying, sub-masterkeying and selective keying is required unit MEM20008 Develop and implement a masterkey system should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms

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Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Assess customer requirements**	2.1	Discuss customer needs and clarify according to SOPs
		2.2	Review appropriate levels of security/access with respect to customer assets, activities and existing security arrangements
		2.3	Interpret architectural plans, floor plans and charts when planning and preparing a masterkey system as required
		2.4	Prepare door and lock schedules and other appropriate documentation according to SOPs
		2.5	Match customer requirements to the mechanical possibilities and limitations of masterkey systems
		2.6	Identify options and advise customer on options and alternatives
		2.7	Identify personal limitations in assessing requirements for key systems and masterkey systems and seek assistance from appropriate person(s) in accordance with SOPs
3	**Design masterkey**	3.1	Develop keying matrix to customer requirements, allowing for future system expansion and mechanical

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	system		capabilities of system
		3.2	Produce key codes (code matrix) from mathematical permutations and calculations according to customer requirements
		3.3	Select key codes from matrix that maximise system security
		3.4	Develop key cutting and cylinder pinning charts
		3.5	Identify incidental masterkeys within progression charts
		3.6	Check and confirm there are no phantoms in the system
		3.7	Apply principles of masterkeying in accordance with industry practice and organisational requirements
4	**Finalise system design**	4.1	Review final system design and keying requirements and confirm with appropriate person(s) in accordance with SOPs
		4.2	Prepare documentation and process and store in accordance with client, legislative and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Reviewed includes one (1) or more of the following:	• physically • off the plan
Customer requirements include one (1) or more of the following:	• specific client requirements and quantities • completion times and dates • job requirements and tasks • signature authorities • WHS requirements • company requirements • compliance with relevant manufacturer requirements • warranties and service information

Key systems include one (1) or more of the following:	• restricted, semi-restricted and non-restricted system numbers
	• manufacturer restricted and factory restricted
	• locksmith restricted/managed
	• association restricted
	• tiers, including:
	  • keyed different (KD)
	  • keyed alike (KA)
	  • masterkey (MK)
	  • grand masterkey (GMK)
	  • great grand masterkey (GGMK)

System expansion includes creation of excess codes to allow for one (1) or more of the following:	• lost keys • unusable codes • future customer requirements • multibroaching

Documentation includes one (1) or more of the following:	• materials used
	• masterkey plans:
	  • key and door schedules
	  • code matrices
	  • pinning charts
	• job sheets
	• manufacturer documentation
	• identified faults
	• warranties and recommendations

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- costs

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20007A Plan and prepare a masterkey system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20007 Plan and prepare a masterkey system

Modification History

Release 1. Supersedes and is equivalent to MEM20007A Plan and prepare a masterkey system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- discussing customer requirements and reviewing appropriate levels of security/access
- interpreting architectural plans, floor plans and charts when planning and preparing a masterkey system
- recognising personal limitations in assessing requirements for key and masterkey systems and seeking assistance from appropriate person(s) in accordance with SOPs
- identifying the appropriate key system and levels according to customer requirements
- undertaking numerical operations and calculations, including mathematical patterns associated with planning and preparing a masterkey system
- developing a masterkey system and key matrix allowing for future expansion
- developing and reading code matrix and selecting codes that maximise system security
- identifying incidental masters in a key system and selecting a group of codes to form a maisioned cylinder
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- record keeping and management
- manufacturers'/Australian/building standards
- product knowledge and limitations
- code matrixes, key and door schedules
- allowances for expansion
- operation and limitations of masterkey systems
- tiers of systems (KD, KA, MK, GMK and GGMK)
- door handing and cylinder types

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- criteria for key code selection
- strategies for checking key systems for interchange and incidental masters
- strategies for checking key systems for phantoms
- principles of maison keying
- strategies for code selection.

Assessment Conditions

- Assessors must:
  - have vocational competency in planning and preparing a masterkey system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20008 Develop and implement a masterkey system

Modification History

Release 1. Supersedes and is equivalent to MEM20008A Develop and implement a masterkey system

Application

This unit of competency defines the skills and knowledge required to create new commercial masterkey systems and expand existing keying systems, using even cut and rotating constant progression methods.

It applies to masterkey systems written manually and using a computer masterkeying package for high security cylinders, primarily for commercial operations.

Where standard hierarchical keying is required unit MEM20007 Plan and prepare a masterkey system should also be selected.

Where a security survey/site assessment is required unit MEM20014 Perform a site security survey should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **6**

Pre-requisite Unit

MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms
MEM20007	Plan and prepare a masterkey system

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Assess customer requirements**	2.1	Consider physical characteristics of existing locks and other security devices and determine requirement for additional site inspection
		2.2	Discuss customer access and task requirements and clarify according to SOPs
		2.3	Interpret architectural plans, floor plans and charts when planning and preparing a masterkey system as required
		2.4	Evaluate customer requirements with respect to current capacity, and make recommendations for the design of new/expanded system
		2.5	Identify personal limitations in assessing requirements for masterkey system and seek assistance from appropriate person(s) in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Design masterkey system and system modifications**	3.1	Design commercial masterkey system to meet customer complex access requirements
		3.2	Check system for interchange
		3.3	Apply principles and processes of masterkeying in accordance with industry practice and organisational requirements
4	**Finalise system design**	4.1	Review final system design and keying requirements and confirm with appropriate person(s) in accordance with organisational requirements
		4.2	Prepare documentation to allow for future interpretation and design requirements
		4.3	Prepare documentation and process and store in accordance with client, legislative requirements and SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Task requirements include one (1) or more of the following:	• specific client requirements and quantities • completion times and dates • job requirements and tasks • signature authorities • WHS requirements • company requirements • compliance with relevant manufacturer requirements, warranties and service information
System expansion includes creation of excess codes to allow for one (1) or more of the following:	• lost keys • unusable codes • future customer requirements • multi-broaching
Commercial masterkey systems include one (1) or more of the following:	• multi-profile inline pin tumbler cylinders • rotating disc tumbler (Abloy) • rotating pin tumbler (Medeco) • radial pin tumbler (Kaba, Mul-T-lock) • pin tumbler sidebar (Bilock, Twin) • slider sidebar (Evva)
Complex access requirements include one (1) or more of the following:	• cross-keying • sub-masterkeying • incidental masterkeying • selective keying • construction keying • maisoning

Documentation includes one (1) or more of the following:	• materials used
	• masterkey plans:
	  • code matrix
	  • key and door schedules
	• job sheets
	• manufacturer documentation
	• identified faults
	• warranties and recommendations
	• costs

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20008A Develop and implement a masterkey system

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20008 Develop and implement a masterkey system

Modification History

Release 1. Supersedes and is equivalent to MEM20008A Develop and implement a masterkey system

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- discussing customer access and task requirements and clarifying in accordance with SOPs
- interpreting architectural plans, floor plans and charts when developing and implementing a masterkey system
- evaluating system and expansion requirements
- determining and designing the required structure of a commercial masterkeying system and key matrix based on customer requirements
- recognising personal limitations in assessing requirements for key and masterkey systems and seeking assistance from appropriate person(s) in accordance with SOPs
- undertaking numerical operations and calculations, including mathematical patterns associated with developing and implementing a masterkey system
- developing and reading progression charts for in-line key systems using even cut and rotating constant methods, rotating disc, radial pin and pin sidebar key systems
- developing and reading progression charts and selecting codes that maximise system security
- identifying incidental masters in a key system, selecting a group of codes to form a maisioned cylinder, determining the maximum number of codes that can be produced and identifying any unused codes in an existing system
- expanding the existing key system by using multi-broached plugs/barrels and by converting the progression from even cut to rotating constant
- checking system for interchange, including accidental interchange in accordance with SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- ethical considerations in locksmithing work
- record keeping and management
- manufacturers'/Australian/building standards
- product knowledge and limitations
- key matrixes and schedules
- allowances for expansion
- operation and limitations of masterkey systems
- tiers of systems (KD, KA, MK, GMK, GGMK)
- door handing and cylinder types
- principles of construction keying, sub-masterkeying, cross-keying, selective keying and maison keying
- criteria for key code selection
- strategies for checking key systems for interchange and incidental masters
- strategies for using incidental masters to create sub-masterkeys, cross-keys and selective keys
- strategies for selecting groups of codes to form a maisioned cylinder.

Assessment Conditions

- Assessors must:
  - have vocational competency in developing and implementing a masterkey system at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20009 Gain entry and reinstate fire and security containers

Modification History

Release 1. Supersedes and is equivalent to MEM20009A Gain entry and reinstate fire and security containers

Application

This unit of competency defines the skills and knowledge required to gain entry to fire and security containers that are fitted with mechanical and electronic safe locking systems. It covers straightforward reinstatement of the locking system by removal and replacement of component parts. Containers may be used for commercial or domestic use.

Where welding skills are required then see the appropriate units.

Where the use of fuel gas cutting equipment is required, unit MEM05007 Perform manual heating and thermal cutting should also be selected.

Where repairs to fire and security containers are required see unit MEM20011 Service and repair fire and security containers.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM20001	Produce keys

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MEM20004 Gain entry

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish entry requirements, authorisations and ownership**	2.1	Establish safe ownership, contents and ownership of contents and verify in accordance with organisational and industry procedures
		2.2	Establish safe type, locking mechanism and other relevant information from appropriate sources and in accordance with organisational and customer requirements
		2.3	Establish nature of problem and circumstances of prior operation in accordance with SOPs, inspection/diagnostic techniques and original specifications
		2.4	Select appropriate entry method in accordance with specific circumstances, customer requirements and SOPs
		2.5	Determine appropriate location of work and arrange safe removal, as necessary
3	**Gain entry to fire**	3.1	Identify site access requirements and make appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	and security containers		arrangements
		3.2	Identify potential and existing risks and hazards and manage, make area secure, and ensure privacy/security of environment in accordance with organisational and legislative requirements
		3.3	Observe safe work practices to minimise risk of injury to self or others in accordance with procedures and organisational requirements
		3.4	Select appropriate tools, equipment, materials and consumables for entry requirements and check for serviceability in accordance with manufacturers' specifications and SOPs
		3.5	Gain entry in accordance with applicable legislation, codes, regulations and standards
4	**Reinstate fire and security container**	4.1	Select, where applicable, replacement and/or repaired parts as appropriate for reassembly
		4.2	Dismantle/remove lock assemblies and components using appropriate SOPs, industry practices, tools and equipment
		4.3	Inspect sub-assemblies, test and adjust for compliance to original factory assembly and function
		4.4	Prepare components, assemble and adjust using fastening equipment and methods that ensure conformance to specifications, correct functioning, quality and safety of the completed assembly
		4.5	Select lubrication, packing, sealing materials and apply correctly in accordance with job specifications
		4.6	Inspect locking system, test and adjust as necessary for compliance to original factory assembly and functioning
5	**Finalise entry and reinstatement**	5.1	Complete documentation and process in accordance with legislative and organisational requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
process	5.2 Clean work area, tools and equipment and store in accordance with SOPs
	5.3 Clean safe and return to serviceable condition
	5.4 Advise customer of work undertaken and further recommended actions and any other relevant information
	5.5 Instruct customer, as necessary, in accordance with organisational procedure and manufacturer recommendations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of:

- face shields, goggles and safety glasses
- hearing protection
- dust masks and respirators
- high visibility vests or clothing
- head protection
- sun protection, hats and sun screen
- gloves and knee pads
- safety footwear
- witches hats
- warning signs and warning tapes
- temporary safety barriers
- fire extinguisher
- first aid kit

Safe types include one (1) or more of the following:

- plate safes
- slab safes
- fire
- data
- cash and/or jewellery
- under-floor
- wall
- free standing
- bank safes and vaults

Appropriate sources of information include one (1) or more of the following:

- catalogues
- manufacturer manuals
- drawings
- detailed/technical sketches
- associated data sheets
- colleague/industry expert
- specifications
- charts

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Basis for entry includes one (1) or more of the following:	• lost combination • lockout (keys inside) • lost keys (rekeys) • malfunction • damage caused by burglary or user • requirement to safely remove, replace and reinstate original and replacement components and locking systems
Customer requirements include one (1) or more of the following:	• function and capabilities • access issues • service and maintenance requirements • product operation and warranty information • costings
Entry method includes one (1) or more of the following:	• mechanical drilling and cutting • safe lever lock - impressioning reading • safe lever lock - picking • safe lock picking • manipulation of mechanical combination locks • manipulation of electro-mechanical combination locks • alternative methods
Risks and hazards include one (1) or more of the following:	• safe construction • chemical, environmental and material hazards • lifting and handling • use of mechanical and fuel gas cutting equipment • electrical wiring • exposure to asbestos, dust, noise, live power, vermin, water and glass fibre

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:	• hand and power tools and accessories specific to gaining entry:
	  • hardened drill bits
	  • special-purpose equipment
	  • borescope, flexi-light and fibre optical scope
	  • automatic dialler (soft drill)
	  • listening devices and manipulation aids
	  • magnetic or vacuum based drills and lever rigs
	• measuring equipment:
	  • vernier callipers
	  • rules
	  • squares
	  • templates
	  • gauges

Materials and consumables include one (1) or more of the following:	• lubricants:
	  • machine oil
	  • general purpose grease
	  • graphite powder
	  • lithium grease
	• adhesives and sealants
	• cleaning materials
	• wire and cable
	• security seals and replacement barrier materials
	• replacement parts

Lock assemblies and components include one (1) or more of the following:	• keylocks • keyless combination locks • electronic digital • electronic and mechanical time delay
Documentation includes one (1) or more of the following:	• historical records • procedures and measurements for opening specific safes • job sheets • invoices • warranties

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20009A Gain entry and reinstate fire and security containers

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20009 Gain entry and reinstate fire and security containers

Modification History

Release 1. Supersedes and is equivalent to MEM20009A Gain entry and reinstate fire and security containers

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- interpreting information specific for gaining entry
- establishing ownership of container and its contents prior to commencing gaining entry
- questioning, confirming and clarifying customer requirements
- communication with the customer as required throughout the entry and reinstatement process
- identifying the safe type and associated equipment and checking function of safe locking systems
- tracing faults and selecting the appropriate entry method
- gaining entry using appropriate tools and equipment
- identifying actual and potential risks and hazards and implementing control measures
- undertaking numerical operations and calculations associated with gaining entry and reinstating fire and security containers
- disassembling/ reassembling lock assemblies and components and selecting materials and consumables
- identifying alternative servicing and repair options in accordance with SOPs
- cleaning worksite in accordance with original presentation, client requirements, industry standards and SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- legislation, codes, regulations and standards applicable to gaining entry to fire and security containers
- sources of specifications and other relevant information for safe locking systems

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- types and classes of safes and locks
- barrier materials used
- tools and equipment to suit entry to specific safes
- components of safe locking systems
- principles of safe systems and component function
- operating principles and technical terminology of safes
- ethical considerations in locksmithing work
- operation of specific locks
- common safe design problems and servicing issues and faults arising from vandalism, misuse and wear
- checks and tests to confirm service requirements
- organisational procedures for establishing service requirements
- procedures to establish and verify safe and contents ownership and obligations, responsibilities, disclaimers and reasons for verifying ownership
- factors impacting on feasibility of repair or replacement
- dismantling and assembly procedures for a range of safe locks and reasons for care and precision
- procedures for replacing worn and damaged parts, removing foreign objects and lubricating, packing and sealing components
- SOPs for cleaning and storage
- key blanks to suit model and mechanical/electronic part of lock
- programming and operating procedures for electronic locks
- documentation and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in gaining entry and reinstating fire and security containers at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM20010 Gain entry and reinstate automotive locking systems

Modification History

Release 1. Supersedes and is equivalent to MEM20010A Gain entry and reinstate automotive locking systems

Application

This unit of competency defines the skills and knowledge required to gain entry to all types of automobiles fitted with mechanical and/or electronic locking systems, and covers straightforward reinstatement of the vehicle locking system by removal and replacement of component parts.

Where interpretation of detailed, complex manufacturer information and specifications is required unit MEM16012 Interpret technical specifications and manuals should also be selected.

Where repairs greater than straightforward remove and replace are required unit MEM20012 Service and repair mechanical automotive locking systems should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms
MEM20004	Gain entry

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Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish entry requirements to automotive locking system**	2.1	Establish the reason for entry
		2.2	Verify authenticity of request in accordance with organisational and industry procedures
		2.3	Establish nature of problem and circumstances of prior operation in accordance with SOPs, inspection/diagnostic techniques and original specifications
		2.4	Identify vehicle, locking system and other relevant information from appropriate sources and in accordance with organisational and customer requirements
		2.5	Obtain and interpret specifications for components from appropriate sources of information
3	**Gain entry to vehicle**	3.1	Select appropriate entry method in accordance with specific circumstances, customer requirements and SOPs
		3.2	Select tools, equipment, materials and consumables appropriate to entry requirements and check for serviceability in accordance with manufacturers' specifications and SOPs
		3.3	Use selected tools to gain entry using appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			industry practices
		3.4	Gain entry in accordance with applicable legislation, codes, regulations and standards
4	**Re-instate automotive locking components and system**	4.1	Select replacement or repaired parts reassembly, where applicable
		4.2	Dismantle/remove lock assemblies and components using appropriate organisational procedures, industry practices, tools and equipment
		4.3	Inspect sub-assemblies, test and adjust as necessary for compliance to original factory assembly and functioning
		4.4	Apply appropriate techniques in the preparation, assembly and adjustment of components parts using fastening equipment and methods that ensure conformance to specifications, operational performance, quality and safety of the completed assembly
		4.5	Select correct lubrication, packing, sealing materials and apply correctly in conformance to job specifications
		4.6	Inspect locking system, test and adjust as necessary for compliance to original factory assembly and functioning
5	**Finalise entry and reinstatement process**	5.1	Complete documentation and process in accordance with legislative and organisational requirements
		5.2	Clean work area, tools and equipment and store in accordance with SOPs
		5.3	Clean vehicle and return to serviceable condition
		5.4	Advise customer of work undertaken and further recommended actions and any other relevant information
		5.5	Instruct customer, as necessary, in accordance with organisational procedures and manufacturer recommendations

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:

- face shields, goggles and safety glasses
- hearing protection
- dust masks and respirators
- high visibility vests or clothing
- head protection
- sun protection, hats and sun screen
- gloves and knee pads
- safety footwear
- witches hats
- warning signs and warning tapes
- temporary safety barriers
- fire extinguisher
- first aid kit

Appropriate sources of information include one (1) or more of the following:

- catalogues
- manufacturer manuals
- drawings
- detailed/technical sketches
- colleagues/industry experts
- computer software
- associated data sheets

Customer requirements include one (1) or more of the following:

- function and capabilities
- access issues
- service and maintenance requirements
- product operation and warranty information
- costings

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Entry method includes one (1) or more of the following:	• pick • impressioning • reading • manipulating linkages • alternative methods
Tools and equipment include one (1) or more of the following:	• hand and power tools specific to gaining entry • power tools and accessories • diagnostic specialist equipment • fixing tools • special-purpose equipment • vacuum cleaner
Materials and consumables include one (1) or more of the following:	• lubricants • adhesives and sealants • cleaning materials • wire and cable
Documentation includes one (1) or more of the following:	• historical records • procedures and measurements for opening specific vehicles • job sheets • invoices • warranties

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20010A Gain entry and reinstate automotive locking systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20010 Gain entry and reinstate automotive locking systems

Modification History

Release 1. Supersedes and is equivalent to MEM20010A Gain entry and reinstate automotive locking systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- verifying authenticity of request in accordance with organisational and industry procedures
- communication with the customer as required throughout the entry and reinstatement process
- legislation, codes, regulations and standards applicable to gaining entry to vehicles
- interpreting information specific for gaining entry
- questioning, confirming and clarifying customer requirements
- identifying automotive locking components and checking function of locking systems
- tracing faults and selecting the appropriate entry method
- gaining entry using appropriate tools and equipment
- identifying actual and potential risks and hazards and implementing control measures
- disassembling/reassembling lock assemblies and components and selecting materials and consumables
- applying appropriate techniques to reinstate locking components and system
- testing and adjusting locking system to confirm operation
- cleaning vehicle in accordance with original presentation, client requirements, industry standards and SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- legislation, codes, regulations and standards applicable to gaining entry and reinstatement of automotive locking systems
- types of vehicle locking systems - mechanical and electronic

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- attachment methods for window winders, internal handles, snibs, trims, cylinders, locks and external handles
- release positions of ignition lock, air bag, front and side and appropriate safety procedures
- break-off bolts, removal and replacement
- window winders and door trims
- door lock retainers
- central locking
- linkages, cables and springs
- techniques for disassembling, reassembling and reinstating locking systems to return to operation
- techniques for disassembling, reassembling and reinstating locking window winders and door trims including associated wiring
- automotive security electronics, alarms and ignition immobilisers
- hazards and control measures associated with gaining entry to automotive locking systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in gaining entry and reinstating automotive locking systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20011 Service and repair fire and security containers

Modification History

Release 1. Supersedes and is equivalent to MEM20011A Service and repair fire and security containers

Application

This unit of competency defines the skills and knowledge required to dismantle, inspect, repair, replace, service and assemble fire and security safes or containers and their components. It applies to service and repair work on commercial and domestic fire and security containers and can apply to regular servicing or call-out work and also be required after entry has been gained.

Where interpretation of detailed, complex manufacturer information and specifications is required unit MEM16012 Interpret technical specifications and manuals should also be selected.

Where gaining entry and reinstatement by straightforward replacement of existing or replacement parts is required unit MEM20009 Gain entry and reinstate fire and security containers should also be selected.

Where welding skills are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms
MEM20006	Maintain and service mechanical locking devices

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify service requirements**	2.1	Establish ownership of safe/container and contents and verify in accordance with organisational, legal and industry procedures
		2.2	Obtain type of safe and lock mechanism specifications from appropriate sources and in accordance with SOPs and customer requirements
		2.3	Establish nature of any damage or malfunction to exterior, interior and lock components in accordance with organisational procedures, established inspection/diagnostic techniques and original specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.4	Establish service and repair requirements and other information relevant to task in accordance with customer needs, organisational and manufacturer specifications and legislation, codes, regulations and standards
		2.5	Determine appropriate location of work and arrange removal of safe, as necessary
3	**Repair, replace and service safe components**	3.1	Identify risks and hazards and make area secure
		3.2	Inspect safe/container locking components and establish further specific repair/service requirements, options and recommend actions in accordance with organisational requirements and factors impacting on feasibility of repair
		3.3	Dismantle lock assemblies and components using appropriate organisational procedures, industry practices, tools and equipment
		3.4	Repair/replace/service components as necessary and practicable
		3.5	Select appropriate lubrication and sealing materials and apply in conformance to standard locksmithing procedures
		3.6	Inspect boltwork and internal lock components, test and adjust as necessary for compliance to original factory assembly and functioning
4	**Finalise servicing/ repair process**	4.1	Test function of specific components and entire locking system for compliance with operational specifications and adjust, as necessary
		4.2	Complete and process documentation in accordance with legislative, assignment and organisational requirements
		4.3	Clean work area, tools and equipment and store in accordance with SOPs
		4.4	Clean safe/container and return to service according to

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	organisational and customer requirements
	4.5 Instruct customer, as necessary, in accordance with SOPs and manufacturer recommendations
	4.6 Confirm work with appropriate person(s) in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:	• face shields, goggles and safety glasses • hearing protection • dust masks and respirators • high visibility vests or clothing • head protection • sun protection, hats and sun screen • gloves and knee pads • safety footwear • witches hats • warning signs and warning tapes • temporary safety barriers • fire extinguisher • first aid kit

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Types of safes include one (1) or more of the following:	• plate safes • slab safes • fire • free standing • data • cash and/or jewellery • under-floor • wall • bank safes and vaults
Lock mechanisms include one (1) or more of the following:	• keylocks • keyless combination locks • electronic digital • electronic and mechanical time delay
Appropriate sources of information include one (1) or more of the following:	• catalogues • manufacturer manuals • drawings • detailed/technical sketches • associated data sheets • colleagues/specialists • internet • charts
Customer requirements include one (1) or more of the following:	• function and capabilities • access issues • service and maintenance requirements • product operation and warranty information • costings • maintaining security

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Other information includes one (1) or more of the following:

- schedules
- timeframes
- access and site information
- products
- installation and upgrade requirements
- specific client requests
- materials
- costings
- warranties and service information
- legislation
- codes and regulatory requirements
- WHS requirements

Risks and hazards include one (1) or more of the following:

- safe construction
- chemical and material hazards
- lifting and handling
- use of mechanical and fuel gas cutting equipment
- exposure to asbestos, dust, noise, live power, vermin, water and glass fibre

Tools and equipment include one (1) or more of the following:

- hand tools relating to safe service and repair
- power tools and accessories
- drop sheets and vacuum cleaner
- various change keys to suit the safe

Materials and consumables include one (1) or more of the following:

- lubricants
- adhesives and sealants
- cleaning materials
- wire and cable
- security seals and replacement barrier materials
- replacement parts

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Documentation includes one (1) or more of the following:	• historical records • procedures and measurements for opening specific safes • job sheets • invoices • warranties

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20011A Service and repair fire and security containers

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20011 Service and repair fire and security containers

Modification History

Release 1. Supersedes and is equivalent to MEM20011A Service and repair fire and security containers

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- establishing ownership of container and its contents prior to commencing service and repair
- interpreting information specific to servicing and repairing fire and security containers
- questioning, confirming and clarifying customer requirements
- identifying the type of safe and checking function of locking mechanism
- tracing faults and using appropriate tools and equipment to service and repair fire and security containers
- identifying actual and potential risks and hazards and implementing control measures
- dismantling lock assemblies using appropriate tools, equipment and procedures and using materials and consumables in accordance with SOPs
- inspecting work to confirm compliance to original factory assembly and functioning
- cleaning safe/container and returning it to service according to organisational and customer requirements
- completing all documentation, including historical records, procedures and measurements for opening specific safes, job sheets, invoices and warranties in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- legislation, codes, regulations and standards applicable to servicing and repairing fire and security containers
- sources of specifications and other relevant information for safe locking systems
- components of safe locking systems
- principles of system and component function
- operating principles and technical terminology relating to safes

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- rating system
- manipulation-proof ratings (classes)
- operation of specific locks
- common safe design problems and servicing issues and faults arising from vandalism, misuse and wear
- fault-finding techniques
- checks and tests to confirm service requirements
- procedures for establishing service requirements
- procedures to establish and verify safe and contents ownership and obligations, responsibilities, disclaimers and reasons for verifying ownership
- environmental, physical and behavioural hazards in relation to safe and surrounds
- factors impacting on feasibility of repair/replacement
- dismantling and assembly procedures for a range of safe locks and reasons for care and precision
- procedures for replacing worn and damaged parts, removing foreign objects and lubricating (non-dry/non grease), packing and sealing components
- organisational requirements for cleaning and storage
- key blanks to suit model and mechanical/electronic part of lock
- programming and operating procedures for electronic locks
- documentation and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing fire and security containers at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20012 Service and repair mechanical automotive locking systems

Modification History

Release 1. Supersedes and is equivalent to MEM20012A Service and repair mechanical automotive locking systems

Application

This unit of competency defines the skills and knowledge required to identify service and repair requirements for mechanical automotive locking systems on commercial and private use vehicles.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM20001	Produce keys
MEM20002	Assemble and test lock mechanisms
MEM20006	Maintain and service mechanical locking devices

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Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify service and repair requirements**	2.1	Establish ownership and verify in accordance with organisational and industry procedures
		2.2	Obtain system and component specifications and other relevant information from appropriate sources and in accordance with organisational and customer requirements
		2.3	Establish nature of damage in accordance with organisational procedures, established inspection/diagnostic techniques and original specifications
		2.4	Establish service and repair requirements and other information relevant to task in accordance with customer needs, organisational and manufacturer specifications and legislation, codes, regulations and standards
3	**Repair, replace and service automotive locking system**	3.1	Identify risks and hazards and make area secure
		3.2	Apply specific isolation and safety measures with special regard to associated equipment
		3.3	Select tools, equipment, materials and consumables, check for serviceability and use

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	3.4	Inspect lock assemblies and components and remove, repair, service and replace as appropriate and practicable, in accordance with SOPs, industry practices and factors impacting on feasibility of repair
	3.5	Inspect sub-assemblies and assemblies, test and adjust as necessary for compliance to original factory assembly and functioning
4 **Finalise servicing process**	4.1	Check function of entire locking system for compliance with operational specifications and adjust, as necessary
	4.2	Complete documentation and process in accordance with legislative, assignment and organisational requirements
	4.3	Clean work area, tools and equipment and store in accordance with SOPs
	4.4	Clean vehicle and return to serviceable condition according to customer and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:

- face shields, goggles and safety glasses
- hearing protection
- dust masks and respirators
- high visibility vests or clothing
- head protection
- sun protection, hats and sun screen
- gloves and knee pads
- safety footwear
- witches hats
- warning signs and warning tapes
- temporary safety barriers
- fire extinguisher
- first aid kit

Appropriate sources of information include one (1) or more of the following:

- catalogues
- manufacturer manuals
- drawings
- detailed/technical sketches
- computer software/internet
- colleagues/industry experts
- associated data sheets

Other information includes one (1) or more of the following:

- schedules
- timeframes
- access and site information
- products
- installation and upgrade requirements
- specific client requests
- materials
- costings
- warranties and service information
- legislation, codes and regulatory requirements
- WHS requirements

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer requirements include one (1) or more of the following:	• function and capabilities • access issues • service and maintenance requirements • product operation and warranty information • costings
Risks and hazards include one (1) or more of the following:	• accidental triggering of supplemental restraint systems (SRS) (air bags) • unique dangers arising from working on the roadside • non-compliance with manufacturer recommendations, materials handling, chemical and environmental • physical hazards
Associated equipment includes one (1) or more of the following:	• air bags and other SRS equipment • steering locking devices • anti-theft devices
Lock assemblies and components include one (1) or more of the following:	• in-line pin • single and double sided wafer • 2 and 4 track • tibbe (rotating disc) • dimple • sidebar • split wafer • new and other mechanisms
Tools and equipment include one (1) or more of the following:	• hand tools • power tools and accessories • security driver bits • fixing tools • special-purpose equipment • trim removal tools • fibre optic scope • soldering iron • vacuum cleaner

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials and consumables include one (1) or more of the following:	• lubricants • adhesives and sealants • cleaning materials • wire and cable • insulation tape/shrink tube/electrical connectors • solder • electronic components
Documentation includes one (1) or more of the following:	• historical records • procedures and measurements for opening specific vehicles • job sheets • invoices • warranties

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20012A Service and repair mechanical automotive locking systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20012 Service and repair mechanical automotive locking systems

Modification History

Release 1. Supersedes and is equivalent to MEM20012A Service and repair mechanical automotive locking systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- establishing ownership of vehicle contents prior to commencing service and repair
- interpreting information specific for servicing and repairing mechanical automotive locking systems
- questioning, confirming and clarifying customer requirements
- identifying the type of locking components and checking functioning of locking systems
- tracing faults and using appropriate tools and equipment to service and repair mechanical automotive locking systems
- identifying actual and potential risks and hazards
- repairing/replacing/servicing locking assemblies using appropriate tools, equipment and procedures
- cleaning vehicle in accordance with original presentation, client requirements, industry standards and SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- attachment methods for window winders, internal handles, snibs, trims, cylinders, locks and external handles
- system and component specifications
- sources of specifications and other relevant information for mechanical automotive locking systems
- components of locking system
- principles of system and component function
- operating principles and technical terminology of specific locks

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- common design problems and faults arising from vandalism, misuse and wear
- checks and tests to confirm service requirements
- organisational procedures for establishing service requirements
- procedures to establish and verify vehicle ownership and reasons for verifying ownership
- operating principles, release positions and isolation techniques for air bags
- factors impacting on feasibility of repair or replacement
- dismantling procedures for a range of automotive locks and reasons for care and precision
- procedures for replacing worn and damaged parts, removing foreign objects and lubricating, packing and sealing components
- organisational requirements for cleaning and storage
- documentation and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing mechanical automotive locking systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20013 Service automotive transponder systems

Modification History

Release 1. Supersedes and is equivalent to MEM20013A Service automatic transponder systems

Application

This unit of competency defines the skills and knowledge required to identify, analyse, encode and re-encode (programme) automotive transponder security systems on commercial and private use vehicles.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C5 (AQF level V).

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM20001	Produce keys

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify service and repair requirements**	2.1	Establish ownership and verify in accordance with organisational and industry procedures
		2.2	Obtain system and component specifications and other relevant information from appropriate sources and in accordance with organisational and customer requirements
		2.3	Establish nature of damage in accordance with organisational procedures, established inspection/diagnostic techniques and original specifications
		2.4	Establish service requirements and other information relevant to task in accordance with customer needs, organisational and manufacturer specifications and legislation, codes, regulations and standards
3	**Service automotive transponder system**	3.1	Identify risks and hazards and make area secure
		3.2	Apply specific isolation and safety measures with special regard to associated equipment
		3.3	Select tools, equipment, materials and consumables, check for serviceability and use in accordance with manufacturers' specifications and SOPs
4	**Program transponder keys**	4.1	Identify personal limitations in programming and seek assistance from appropriate sources

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.2 Establish programming requirements in accordance with SOPs and supplier require
	4.3 Programme keys to correct specifications
	4.4 Test system function to ensure correct operation
5 **Finalise servicing process**	5.1 Complete documentation and process in accordance with legislative, assignment and organisational requirements
	5.2 Clean work area, tools and equipment and store in accordance with SOPs
	5.3 Clean vehicle and return to serviceable condition

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:

- face shields, goggles and safety glasses
- hearing protection
- dust masks and respirators
- high visibility vests or clothing
- head protection
- sun protection, hats and sun screen
- gloves and knee pads
- safety footwear
- witches hats
- warning signs and warning tapes
- temporary safety barriers
- fire extinguisher
- first aid kit

Appropriate sources of information include one (1) or more of the following:

- catalogues
- manufacturer manuals
- drawings
- detailed/technical sketches
- associated data sheets
- colleagues/industry experts
- computer software

Other information includes one (1) or more of the following:

- schedules
- timeframes
- access and site information
- products
- installation and upgrade requirements
- specific client requests
- materials
- costings
- warranties and service information
- codes
- WHS requirements

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Customer requirements include one (1) or more of the following:	• function and capabilities • access issues • service and maintenance requirements • product operation and warranty information • costings
Risks and hazards include one (1) or more of the following:	• accidental triggering of supplemental restraint systems (SRS) (air bags) • unique dangers arising from working on the roadside • non-compliance with manufacturer recommendations, materials handling, chemical and environmental • physical hazards
Associated equipment includes one (1) or more of the following:	• SRS • electronic immobilisers • steering locking devices • anti-theft devices
Tools and equipment include one (1) or more of the following:	• hand tools • specialist diagnostic equipment • encoding equipment
Documentation includes one (1) or more of the following:	• historical records • procedures and measurements for opening specific vehicles • job sheets • invoices • warranties

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20013A Service automatic transponder systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20013 Service automotive transponder systems

Modification History

Release 1. Supersedes and is equivalent to MEM20013A Service automatic transponder systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- establishing and verifying ownership in accordance with organisational and industry procedures
- interpreting information specific for servicing automotive transponder systems
- questioning, confirming and clarifying customer requirements
- recognising personal limitations in assessing requirements for automotive transponder systems and seeking assistance from appropriate person(s) in accordance with SOPs
- identifying automotive locking components and associated equipment and checking functioning of locking systems
- tracing faults and using appropriate tools and equipment to service automotive transponder systems
- identifying actual and potential risks and hazards
- establishing program requirements, programming keys to correct specification, and testing system for conformance
- cleaning worksite in accordance with SOPs
- completing all documentation in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- system and component specifications and principles of operation
- sources of specifications and other relevant information for automotive transponder systems
- types of transponders and technical terminology used
- common design problems and faults arising from vandalism, misuse and wear
- checks and tests to confirm service requirements

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- organisational procedures for establishing service requirements
- procedures to establish and verify vehicle ownership and reasons for verifying ownership
- operating principles, release positions and isolation techniques for air bags
- operation and function of transponder and engine immobiliser systems
- factors impacting on feasibility of repair or replacement
- dismantling procedures for a range of automotive locks and reasons for care and precision
- procedures for replacing worn and damaged parts, removing foreign objects and lubricating, packing and sealing components
- organisational requirements for cleaning and storage
- key blanks to suit model and mechanical/electronic part of lock
- different types of transponder technologies
- programming and operating procedures for encoder/diagnostic machine
- documentation and recording procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing automatic transponder systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM20014 Perform a site security survey

Modification History

Release 1. Supersedes and is equivalent to MEM20014A Perform a site security survey

Application

This unit of competency defines the skills and knowledge required to examine and assess security requirements across commercial, industrial and domestic applications and requires the ability to source relevant information, establish security risk and use appropriate assessment methods to ensure an accurate determination of security equipment/system options to meet client needs.

Where estimates and quotes are required unit CPPSEC3047A Provide estimate and quote on security system should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Locksmithing

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare to assess security requirements**	2.1	Review job requirements and clarify with appropriate person(s) in accordance with organisational requirements
		2.2	Conduct discussions with customer to establish actual and potential security risks and clarify scope of work
		2.3	Apply effective interpersonal techniques when interacting with customer
		2.4	Identify site access and specific site requirements and make appropriate arrangements, as required, in accordance with client and organisational requirements
		2.5	Identify personal limitations in assessing security requirements and seek assistance from appropriate person(s)
3	**Assess security requirements**	3.1	Identify site restrictions, regulations and requirements in accordance with client and organisational requirements
		3.2	Gather relevant information from identified sources and apply to assignment requirements
		3.3	Carry out a site assessment to facilitate an accurate determination of security requirements, where possible
		3.4	Review client assets, activities and existing security arrangements to assess the level and range of security risk to client operations
		3.5	Identify weak points, risk areas and environmental factors affecting the security risk of the site and assess in accordance with organisational procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Document security assessment**	4.1 Record information and store in accordance with organisational procedures
	4.2 Complete a comprehensive assessment of client security requirements within designated timeframes and present for review to appropriate person(s)
	4.3 Prepare a security survey in accordance with industry and organisational standards of style, format and accuracy
	4.4 Make recommendations for security equipment/systems and provide alternative options in accordance with organisational requirements
	4.5 Process documentation in accordance with legislative, assignment and organisational requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Job requirements include one (1) or more of the following:	• instructions from supervisor/management • work schedules and completion dates • specific client requirements • site requirements • security clearance and access requirements • reporting and documentation requirements • budget allocations • national construction code • fire regulations
Appropriate person(s) includes one (1) or more of the following:	• clients • site managers • project managers • engineers and technicians • technical experts • line managers/supervisors • colleagues • regulatory personnel • security consultants
Customer includes one (1) or more of the following:	• owner • property/other agent • tenant • building supervisor • manager • project manager • architect • government and legal instruments/agencies
Scope of work includes one (1) or more of the following:	• personal protection • access requirements • property or assets • conformance with insurance • legislative or other requirements

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Interpersonal techniques include one (1) or more of the following:	• verbal or non-verbal language • two-way interaction • constructive feedback • active listening • questioning to clarify and confirm understanding • interpreting non-verbal and verbal messages • observation techniques • use of positive, confident and cooperative language • control of tone of voice and body language • use of language and concepts appropriate to cultural differences • clear presentation of options and consequences • demonstrating flexibility and willingness to compromise
Site access and specific site requirements include one (1) or more of the following:	• access and egress points • time of access • access codes • keys and passes • security clearances • union requirements • WHS requirements • building codes and regulations • heritage listings • noise control

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Security threats and risks include one (1) or more of the following:

- vandalism
- sabotage
- trespass
- break-in
- burglary
- assault or harm
- unauthorised access
- accidents
- theft
- pilferage
- terrorist acts
- theft of information
- rioting and civil disorder
- natural disasters
- power loss
- deliberate/accidental damage to people, property and premises

Weak points and risk areas include one (1) or more of the following:

- unsecured or poorly secured entry points
- entry points screened from public view
- entry points with old or worn locks
- external doors without deadlocks or with hinges opening outward
- flimsy building materials and client habits

Environmental factors include one (1) or more of the following:

- adequacy of street lighting
- traffic flow
- neighbourhood crime rating
- proximity of other buildings

Assessment includes involving one (1) or more of the following:

- discussions with client
- crime prevention through environmental design (CPTED) site inspection
- visual inspections
- review of client floor plans and supporting documentation
- police/insurance companies

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Information includes one (1) or more of the following:	• value or importance of assets • insurance policy agreements • special rooms or areas requiring higher level of protection • current/proposed operating environments • assets and systems • activities and functions • existing security systems/equipment • existing management strategies • business and operational plans • incident history
Site assessment includes one (1) or more of the following:	• type and condition of building structures • identification of risk areas/weak points • site restrictions • regulations and requirements • access and egress patterns • floor plan • existing security equipment/systems

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Security equipment and systems include one (1) or more of the following:	• detection devices • audible/visual warning devices • cameras • monitors and control equipment • control panels • intercoms • wireless equipment • car alarms • electronic readers • electronic recognition controls • locks and locking systems • grills • lighting • boom gates • turnstiles • bank pop-up screens • smoke detection devices • electric/mechanical fire safety and fire locking systems • power supplies • batteries • security doors and door controls
Documentation includes one (1) or more of the following:	• checklists • reports • floor plans • client briefs • specifications • schedules • site survey

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM20014A Perform a site security survey

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM20014 Perform a site security survey

Modification History

Release 1. Supersedes and is equivalent to MEM20014A Perform a site security survey

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- using effective interpersonal techniques when interacting with customer
- identifying site access and specific site requirements
- identifying security threats and risks
- recognising personal limitations in assessing requirements for surveying site security and seeking assistance from appropriate person(s) in accordance with SOPs
- carrying out a site assessment and identifying weak points and risk areas affecting the security risk to the site
- preparing a security survey, including environmental factors that impact on the type of security system to be fitted
- making recommendations for security equipment and systems
- completing all documentation in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- risk assessment methods and procedures
- risks and threats to site security
- available security equipment/system options and basic requirements for installation
- types and functions of security equipment and systems
- building construction methods and types
- organisational and client confidentiality requirements
- basic problem solving strategies
- operational principles of information technology
- interpersonal techniques
- documentation requirements and processes.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing a site security survey at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21001 Replace watch batteries, capacitors and bands

Modification History

Release 1. Supersedes and is equivalent to MEM21001A Replace watch batteries, capacitors and bands

Application

This unit of competency defines the skills and knowledge required to select and replace electronic watch power sources and bands and includes conducting any required water-resistance testing.

It applies to work conducted in a watch service and repair workshop, kiosk or jewellery store with access to the appropriate equipment.

Where additional servicing of watch cases is to be performed unit MEM21003 Perform watch case servicing, repair and refurbishment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with standard operating procedures
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish servicing requirements and liaise with customer**	2.1	Inspect watch condition and type and discuss performance concerns with customer
		2.2	Verify and agree on servicing requirements with customer
		2.3	Carry out pre-repair tests to verify water resistance
		2.4	Prepare watch for handover
		2.5	Record and document repair process
3	**Open and close watch cases**	3.1	Select and use appropriate workshop tools and equipment
		3.2	Identify watch and band construction and components
		3.3	Open and close watch cases
		3.4	Inspect parts and report and record results
		3.5	Verify gasket condition and replace, as required
		3.6	Clean cases and bands, as required, during and after repair
4	**Select and replace power sources**	4.1	Remove power sources using appropriate tools and equipment

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		4.2	Inspect watch for battery leakage damage and clean or refer for further service, as appropriate
		4.3	Assess physical condition of existing cell and its operation under load
		4.4	Select, replace and secure appropriate replacement power sources
		4.5	Perform integrated circuit resetting or all clear operations, as required
		4.6	Handle, store and dispose of power sources in accordance with environmental guidelines
5	**Perform electrical testing**	5.1	Set up and use multimeters in a correct manner
		5.2	Test cell terminal voltage under load using correct methods and equipment
		5.3	Test watch circuitry for current consumption using correct methods and equipment
		5.4	Confirm results against manufacturer specifications
6	**Select and replace bands**	6.1	Identify band attachment and removal method
		6.2	Remove and replace bands and components, as necessary, using appropriate methods, tools and equipment
		6.3	Determine dimensions and type of replacement bands/components required
7	**Conduct water-resistance testing**	7.1	Identify watches requiring water-resistance or pressure testing
		7.2	Select appropriate water-resistance testing methods and equipment according to watch type
		7.3	Set up and use equipment to verify results

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Preparing watch for handover includes one (1) or more of the following:	• confirming watch keeping on time • function checking (calendar, light, chronograph and alarm) • confirming display setting (time, calendar and other multi-functions)
The time keeping element in electronic watches includes one (1) or more of the following:	• quartz crystal • kinetic mechanism • tuning fork • electronic balance
Watch construction and components include one (1) or more of the following:	• mechanical • electronic • digital • analog • duo • kinetic • auto quartz
Band construction and components include one (1) or more of the following:	• bracelets • bands • clasps • straps

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Workshop tools and equipment include one (1) or more of the following:	• hand tools appropriate to watch case construction and repair of watches • PPE • non-conductive tweezers • case opening and closing tools • glass and case press • plastic sheet protection • cleaning brushes • rodico
Power sources include one (1) or more of the following:	• primary and secondary cells • silver oxide cells, including high, low and multi-drain types • capacitors • lithium batteries
Record and document repair includes one (1) or more of the following:	• date and extent of repairs completed • cost of components replaced or used • time spent on procedure • marking the date of fitting for replacement cell/code • electrical testing results (current consumption/ running time calculated) • water-resistance test results
Band attachment and removal includes one (1) or more of the following:	• springlug • tapered pin • cotter pin • screwed
Multimeters include one (1) or more of the following:	• analog • digital • external power supplies • ampere • volts • Ohms

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Water-resistance testing methods include one (1) or more of the following:	• Australian Standard for watches and water-resistant/divers watches • vacuum or over pressure • air leak • water immersion • condensation test

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21001A Replace watch batteries, capacitors and bands

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21001 Replace watch batteries, capacitors and bands

Modification History

Release 1. Supersedes and is equivalent to MEM21001A Replace watch batteries, capacitors and bands

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and carrying out pre-repair tests on watches, and recording and documenting repair process
- opening and closing watch cases using appropriate watch repairers' tools and confirming watch movement's performance
- identifying, handling and storing power cells
- performing electrical testing using electrical test equipment and confirming results against manufacturers' specifications
- removing bands and band attachments using appropriate methods, tools and equipment
- determining dimensions of band width
- applying water-resistance testing methods and verifying results
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- watch and band construction, components and materials
- operating principles of power cells, batteries, capacitors and voltages (1.55v d.c. – 3v d.c.)
- methods of identifying watches requiring water-resistance or pressure testing
- how to confirm battery capacity
- handling, storage and disposal procedures for watch power sources
- removal procedures for watch glasses, gaskets and other components
- environmental guidelines and regulations relevant to the disposal of watch power sources
- multimeter types and how to set up, use and record values
- Australian Standards for water-resistant watches
- methods of identifying watches requiring water-resistance or pressure testing

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- methods of water-resistance testing for watches and advantages and disadvantages of each method.

Assessment Conditions

- Assessors must:
  - have vocational competency in replacing watch batteries, capacitors and bands at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21002 Perform watch movement exchange

Modification History

Release 1. Supersedes and is equivalent to MEM21002A Perform watch movement exchange

Application

This unit of competency defines the skills and knowledge required to repair watches through replacement of quartz and mechanical watch movements.

Where water-resistance testing is required see unit MEM21003 Perform watch case servicing, repair and refurbishment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21001	Replace watch batteries, capacitors and bands

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	Determine job	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish servicing requirements and liaise with customer**	2.1	Verify watch condition and performance concerns with customer
		2.2	Prepare written and verbal quotations
		2.3	Confirm customer agreement on recommended service procedures to remedy faults
		2.4	Record and document repair process
3	**Open and close watch cases**	3.1	Verify and agree on servicing requirements
		3.2	Select and use appropriate workshop tools and equipment
		3.3	Open and close watch cases
		3.4	Verify condition of case back/gaskets and replace, as required
		3.5	Clean case components, as required
4	**Remove and replace watch movements**	4.1	Establish appropriate working environment
		4.2	Identify and follow correct sequence for removal and replacement of watch movements
		4.3	Remove and replace, without damage, crown, stem and case fixings including case screws, movement rings and stem
		4.4	Determine condition of crown, stem, pendant and pushbuttons, and perform custom replacement, as

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			required
		4.5	Remove and replace movements without damaging, marking or leaving fingerprints
		4.6	Verify correct replacement movement is selected
5	**Remove and replace hands and dials**	5.1	Identify release mechanism for watch dials
		5.2	Remove and replace hands and dials without marking or damaging components
		5.3	Check and service hands and dials, as required
		5.4	Fit hands to synchronise with each other, dial batons and calendar
		5.5	Use correct workshop tools and equipment taking precautions for removal and replacement
		5.6	Check hands and dial clearances
6	**Conduct final inspections**	6.1	Inspect watch for cleanliness and rectify imperfections and faults
		6.2	Check functionality of crown, stems and pushbuttons
		6.3	Confirm watch performance, hand alignment and calendar function and synchronisation
		6.4	Record and document repair

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Record and document repair includes the following:	• date and extent of repair • cost of replacement part • time spent on procedure
Workshop tools and equipment include one (1) or more of the following:	• specialised hand removers • case opening tools • cutting tools • files • hand fitting tools • general hand tools • cleaning media and lubricants
Appropriate working environment includes one (1) or more of the following:	• suitable watchmaker's bench • clean and orderly work area (precautions taken to minimise dust) • adequate lighting • ergonomic chair with adjustable height
Case fixings include one (1) or more of the following:	• case screws • movement rings • stem
Custom replacement includes one (1) or more of the following:	• determining custom stem length • cutting and filing stem end and securing crown • replacing screw or friction fitted worn or damaged pendants • servicing, cleaning and replacing pushbutton • inspecting all crown, pendant, pushbutton gaskets for condition, and replacing and lubricating, as required
Check and service hands and dials include one (1) or more of the following:	• luminance of hands • dial feet condition • rust and contamination • water marks • damage and wear to hands

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Clearances include one (1) or more of the following:	• hand clearance from each other • hand clearance from dials • hand clearance from glass

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21002A Perform watch movement exchange

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21002 Perform watch movement exchange

Modification History

Release 1. Supersedes and is equivalent to MEM21002A Perform watch movement exchange

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and verifying condition and performance, identifying repair costs and recording and documenting repair process
- opening and closing watch cases for watch movement exchange using appropriate workshop tools and equipment
- cleaning watch components in accordance with procedures
- replacing watch movements for both quartz and mechanical watches in an appropriate work environment without damage or marking movement
- selecting and fitting replacement case parts, crown and stems without damage and performing custom replacement, as required
- removing and replacing hands and dials without damaging or marking components and checking and servicing hands and dials
- ensuring correct dial, hand alignment and clearances
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of watch construction
- methods of identifying watches requiring water-resistance or pressure testing
- types of stems and crowns
- hand tools
- stem position for removal
- various watch case components
- various types, styles and materials of dials and hands
- various watch crown types, styles and materials.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing watch movement exchange at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21003 Perform watch case servicing, repair and refurbishment

Modification History

Release 1. Supersedes and is equivalent to MEM21003A Perform watch case servicing, repair and refurbishment

Application

This unit of competency defines the skills and knowledge to service and repair watch cases, including replacement techniques for auxiliary components. It includes refurbishment of watch cases and bands by polishing and graining and water-resistance testing methods and procedures.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21001	Replace watch batteries, capacitors and bands
MEM21002	Perform watch movement exchange

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish servicing requirements and liaise with customer**	2.1	Identify watch case type, functions, construction and components
		2.2	Carry out pre-repair tests to verify water-resistance, as required
		2.3	Prepare written quotation and inform customer of watch case condition and outline recommended service procedures
		2.4	Verify and agree on servicing requirements with customer
		2.5	Prepare watch for handover
		2.6	Record and document repair process
3	**Disassemble watch case and components for servicing**	3.1	Establish an appropriate clean and safe work environment
		3.2	Open and close watch cases
		3.3	Use hand tools and equipment in safe and correct manner
		3.4	Remove watch case, sub-assemblies and components in correct sequence without damaging, marking or leaving fingerprints
		3.5	Verify condition of case gaskets and replace, as required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Repair and refurbish watch case, sub-assemblies and components**	4.1	Inspect condition of watch case, including case sub-assemblies and components
		4.2	Replace faulty or damaged or worn watch case, sub-assemblies and components
		4.3	Select appropriate media for polishing and graining case and band components
		4.4	Set up and operate machines and equipment safely for polishing and graining
		4.5	Select appropriate case and band cleaning methods
		4.6	Inspect watch case for condition and cleanliness and rectify imperfections and faults
5	**Reassemble watch case, sub-assemblies and components**	5.1	Reassemble and fit watch case, sub-assemblies and components according to manufacturer specifications
		5.2	Lubricate watch case, including case sub-assemblies and components and sub-assemblies according to manufacturer specifications
		5.3	Verify security, functioning, and operation of watch case, sub-assemblies and components
		5.4	Apply watch case assembly inspections and precautions
6	**Perform water-resistance testing for watch cases**	6.1	Verify and confirm water-resistance rating of watch case
		6.2	Identify, set up and operate equipment for water-resistance testing and interpret readings
		6.3	Verify watch case performance and repair or replace components and gaskets, as required, to industry standards

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch case auxiliary components include one (1) or more of the following:	• watch glasses • pendants • pushbuttons and correctors • bezels • case backs • gaskets • crowns and bands • straps or bracelets
Watch case types include (1) one or more of the following:	• pocket watch • wrist watch • ring watch • necklace • specialist watches • non water-resistant (two piece case) • non water-resistant (three piece case) • water-resistant (two piece case) • monocoque (one piece case)
Watch materials include one (1) or more of the following:	• precious metals • stainless steel • ceramic • titanium • others

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch construction includes one (1) or more of the following:	• case body • bezel glass • case back • pushbutton • case ring • gaskets
Watch case/band condition includes one (1) or more of the following:	• completeness • scratches, dents and worn plating • general wear and tear • water-resistance performance
Recommended service procedures include the following:	• replace worn or damaged components • repair • refurbish • case refurbishment to customer requirements
Record and document repair includes the following:	• extent and date of repair • cost of replacement parts • time spent on procedure
Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment organised and in good condition • ergonomic seating • dust extraction
Case components and movement sub-assemblies include one (1) or more of the following:	• glass • spring fit • armoured • mineral and sapphire • bezel • case back and gaskets • crown • pendant (friction fit or screwed) • gaskets

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Inspect condition includes one (1) or more of the following:	• originality of components • cleanliness • wear • damage • corrosion
Watch case assembly inspections and precautions include one (1) or more of the following:	• use plastic protection whilst opening and closing • alignment of components • security of pendants • pushbutton operation • screw crowns and stem length • damage to stem when securing crown • cleanliness
Water-resistance rating includes one (1) or more of the following:	• minimum standard of 20 metres, or additionally to 30 metres and 50 metres • minimum standards for divers watch of 100 metres or up to 3000 metres
Methods to test water-resistance include one (1) or more of the following:	• vacuum • over pressure • combined test • water immersion method • air leak method • condensation test
Hand tools and equipment include one (1) or more of the following:	• pin vices and case holders • case opening and closing tools • glass press and vigor tool • adhesives • polishing machines and various grades of buff wheels • polishing and graining (3M media in various grades)

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21003A Perform watch case servicing, repair and refurbishment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21003 Perform watch case servicing, repair and refurbishment

Modification History

Release 1. Supersedes and is equivalent to MEM21003A Perform watch case servicing, repair and refurbishment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and verifying condition and performance, identifying repair costs and recording and documenting service/repair process
- servicing, inspecting, repairing and replacing watch case components in an appropriate work environment
- selecting and using appropriate workshop tools, equipment and media for watch case servicing, polishing and graining
- determining and conducting appropriate tests for water-resistant watches
- safely cleaning watch cases and bands.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of construction of watch cases by style, design, material and quality
- types of watch glass materials, construction and fitting procedures, including use of adhesives, as required
- types of crown construction by style, design, material and quality
- types of case gasket materials and construction fitting procedures
- types of crown styles, materials and construction
- types of pushbutton construction
- standards for water-resistance ratings
- standards for water-resistance testing methods
- procedures for testing water-resistant and divers watches
- function and operating principles for water-resistance testing
- tools and equipment for servicing watch cases and components
- watch case cleaning methods

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- types of band construction, components and materials.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing watch case servicing, repair and refurbishment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21004 Clean watch and clock components

Modification History

Release 1. Supersedes and is equivalent to MEM21004A Clean watch and clock components

Application

This unit of competency defines the skills and knowledge required to apply cleaning techniques for watch and clock movements, cases and other components by manual, mechanical and electronic methods, using a range of media.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Identify job requirements from specifications, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Apply principles of WHS to cleaning activities**	2.1	Select and use appropriate personal protective equipment (PPE) based on information in relevant safety data sheet (SDS)
		2.2	Identify hazards associated with cleaning equipment and media
		2.3	Follow emergency response procedures
3	**Select and prepare appropriate methods, equipment and solutions**	3.1	Select cleaning methods, processes and equipment according to type and size of mechanisms, components and cases
		3.2	Select cleaning solutions appropriate to component, finish, surface coating and material
		3.3	Decant, mix and prepare solutions for use
		3.4	Dispose of chemicals according to manufacturer guidelines, legislation and regulations
4	**Prepare parts and components for cleaning**	4.1	Dismantle watch or clock and component parts to optimise cleaning
		4.2	Pre-clean components, as required, for inspection
		4.3	Arrange components during machine cleaning to prevent damage
		4.4	Arrange and sequence parts and components for cleaning to assist subsequent identification, reassembly and to optimise cleaning
5	**Perform cleaning operations**	5.1	Set up and operate cleaning equipment using correct and safe work practices
		5.2	Monitor and control exposure of components to solutions during cleaning process

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		5.3 Remove residues, dry and handle cleaned components, as appropriate
		5.4 Arrange storage of cleaned components to maintain finish and cleanliness
6	**Assess outcomes of cleaning process**	6.1 Verify condition of cleaned components and identify remaining residues and contaminants, damage to surface coatings and other component damage
		6.2 Account for all components

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

PPE includes one (1) or more of the following:	• protective masks • gloves for handling chemicals • fire blankets and extinguishers • ventilation of cleaning area • clothing (dustcoats and aprons)
Emergency response procedures include one (1) or more of the following:	• safe selection and use of fire extinguishers • use of safety blankets and other methods of suppressing solvent-based fires • emergency treatment of eye splashes and chemical burns • emergency treatment of chemical inhalation and absorption

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Cleaning methods, processes and equipment include one (1) or more of the following:	• rotational mechanical processes • vibrational mechanical processes • electronic (ultrasonic) • steam cleaning • cleaning machines • cleaning baskets • hand cleaning
Cleaning solutions include one (1) or more of the following:	• number 1 degreasing and cleaning solution (WF1) • customised solutions • ammonia • oleic acid • acetone • water-based solutions • commercial grade ammonia concentrates • rinsing solutions • hydrocarbon solvents

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21004A Clean watch and clock components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21004 Clean watch and clock components

Modification History

Release 1. Supersedes and is equivalent to MEM21004A Clean watch and clock components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting appropriate cleaning methods, processes and equipment appropriate to the work being carried out
- selecting cleaning solutions appropriate to component, finish, surface coating and material
- working safely with chemicals and equipment based on information in relevant safety data sheet (SDS)
- sorting and tracking components during cleaning process
- cleaning components without damage and verifying components have been effectively cleaned
- following emergency response procedures, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- cleaning solutions and uses
- cleaning procedures for different components and finishes
- watch case cleaning methods (ultrasonic and vibrationary)
- cleaning machine types, uses, function and operation
- potential for damage to components by chemicals or cleaning operations
- chemical storage and disposal.

Assessment Conditions

- Assessors must:
  - have vocational competency in cleaning watch and clock components at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21005 Diagnose faults in quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21005A Diagnose faults in quartz watches

Application

This unit of competency defines the skills and knowledge required to test and diagnose faults in electronic quartz watches.

It applies to diagnosing faults where the power cell performance has already been tested and its condition is assessed as good or the correct terminal voltage under load, but the watch continues to indicate faults or is stopped.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21001	Replace watch batteries, capacitors and bands

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Establish servicing requirements and liaise with customer**	2.1	Verify watch condition and performance concerns with customer
		2.2	Prepare written and verbal quotations
		2.3	Confirm customer agreement on recommended service procedures to remedy faults
		2.4	Record and document repair process
3	**Open and close watch cases**	3.1	Determine need to open case for further testing
		3.2	Select and use appropriate workshop tools and equipment
		3.3	Open and close watch cases
		3.4	Inspect parts and report and record results
		3.5	Verify gasket condition and replace, as required
		3.6	Clean cases and bands during and after repair, as required
4	**Perform test**	4.1	Select appropriate tests for the type of quartz watch
		4.2	Select and use appropriate workshop testing equipment
		4.3	Test quartz watch output signals using industry-specific equipment
		4.4	Assess mechanical condition, including freedom of gear train, as applicable

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.5	Maintain testing equipment
	4.6	Record test results
5 **Analyse results and determine faults**	5.1	Interpret test results
	5.2	Carry out further testing to locate faulty components, as required
	5.3	Confirm results against manufacturer specifications
	5.4	Identify faults from test information
	5.5	Evaluate record and communicate recommended servicing requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Types of quartz watches include one (1) or more of the following:	• analog, digital and duo displays • anadigi • calendar and/or moon phase • chronograph and perpetual calendar • alarm and kinetic • auto quartz

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Record and document repair process includes one (1) or more of the following:	• reference to manufacturers' technical guides • customer written quotation detailing faults • recommendations of most appropriate service procedure • estimation of replacement part • time spent on procedure

Tools and equipment include one (1) or more of the following:	• watch case opening and closing tools
	• hand tools, including:
	  • tweezers
	  • screwdrivers
	  • eyeglasses

Tests include one (1) or more of the following:	• acoustic, capacitive and inductive pick-ups/sensors • quartz crystal oscillating signals (32 KHz) • voltage, resistance and current consumption • output pulses (integrated circuits) • pulse generation of step motor • lower working limit • capacitive rate • inhibition rate
Workshop testing equipment includes one (1) or more of the following:	• quartz timing machines with acoustic and capacitive pick-up • inductive pick-up sensors • multimeters • variable voltage supplies • pulse generators
Faulty components include one (1) or more of the following:	• quartz crystal • integrated circuits • electronic circuits • coils • step motors • gear train • dial train • dials and hands

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21005A Diagnose faults in quartz watches

Links

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Assessment Requirements for MEM21005 Diagnose faults in quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21005A Diagnose faults in quartz watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and verifying condition and performance, identifying repair costs, and recording and documenting repair process
- opening and closing watch cases using appropriate workshop tools and equipment
- using workshop testing equipment
- selecting and performing appropriate tests and analysing test results
- determining faults and faulty components based on test results and visual inspection.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of quartz watch construction and components
- function/operating principles of electronic quartz watches
- types of cells, power sources, capacitors and electronic storage units
- observation and inspection techniques
- work health and safety (WHS) regulations and procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing faults in quartz watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21006 Service quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21006A Service quartz watches

Application

This unit of competency defines the skills and knowledge required to service quartz analog and digital display watches, including modules and case components.

This unit is a common servicing requirement for watch repairers and can extend, in some cases, to the work of service technicians.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21001	Replace watch batteries, capacitors and bands
MEM21002	Perform watch movement exchange
MEM21005	Diagnose faults in quartz watches

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify watch functions and features
		1.4	Prepare written quotation and inform customer of watch condition and performance concerns
		1.5	Outline recommended service procedures to be undertaken to remedy identified faults
		1.6	Verify and agree on servicing requirements with customer
		1.7	Prepare watch for handover
		1.8	Record and document repair process
2	**Disassemble watch case and movement components for servicing**	2.1	Establish appropriate working environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Select and use appropriate workshop tools and equipment
		2.4	Open and close watch cases
		2.5	Remove case movement and components without damaging or marking
		2.6	Verify gasket condition and replace, as required
		2.7	Clean cases and bands, as required
3	**Service watch case and movement**	3.1	Inspect condition of watch case and movement components
		3.2	Confirm servicing requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	components	3.3	Replace faulty or worn component parts
		3.4	Clean components and parts
		3.5	Inspect watch case and movement components for cleanliness and rectify imperfections/faults
		3.6	Use correct tools and equipment for handling and servicing
4	**Reassemble and test watch case and movement components**	4.1	Reassemble watch case and movement components according to manufacturer specifications
		4.2	Confirm correct assembly of gear train and other components
		4.3	Use correct types and amounts of lubricant according to manufacturer specifications
		4.4	Use tools and equipment appropriately taking precautions for correct reassembly
		4.5	Verify/confirm watch functioning according to manufacturer specifications
		4.6	Verify watch performance including rate testing and adjust according to manufacturer specifications, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch functions and features include one (1) or more of the following:	• quartz oscillating stage • dividing stage • motor drive output pulses • capacitive output signals • current consumption • pulse generation • lower working limit test • gear train freedom
Record and document repair process includes one (1) or more of the following:	• extent and date of repair • cost of replacement part • time spent on procedure
Appropriate working environment includes the following:	• suitable watchmakers' bench • clean and orderly work area (precautions taken to minimise dust) • adequate lighting and ventilation • ergonomic chair with adjustable height
Workshop tools and equipment include one (1) or more of the following:	• timing machine • multimeter • pulse generator • watch repair hand tools • case opening and closing tools • cleaning media • cleaning machines • lubricants • PPE

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Movement and case components include one (1) or more of the following:	• quartz crystal • electronic circuits • coils • mechanical gear train • liquid crystal displays • watch glasses • case back • bezel (rotating) • crown • pendant • pushbuttons
Watch performance/rate testing includes one (1) or more of the following:	• current consumption according to manufacturer specifications • rate testing (seconds/day)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21006A Service quartz watches

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21006 Service quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21006A Service quartz watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and verifying condition and performance, identifying service costs, and recording and documenting repair process
- diagnosing and fault finding quartz analog and digital watches in an appropriate work environment
- dismantling and reassembling quartz watch digital modules, movements, gear trains and sub-assemblies using appropriate workshop tools and equipment
- using appropriate watch movement/components cleaning techniques without damage or marking to case movement and components
- applying correct type and amount of lubrication according to manufacturers' specifications
- performing watch function and electrical performance testing, including current consumption, according to manufacturer specifications and rate testing.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- quartz watch construction and components (i.e. analog, digital and duo displays)
- quartz watch operating principles (analog and digital)
- quartz watch lubrication techniques
- watch case and band construction and components
- testing procedures to confirm watch function
- watch servicing requirements
- repair process recording procedures
- watch handover procedures
- client liaison techniques
- power sources
- power cells, batteries, capacitors and electronic storage units.

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Assessment Conditions

- Assessors must:
  - have vocational competency in servicing quartz watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21007 Service complex quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21007A Service complex quartz watches

Application

This unit of competency defines the skills and knowledge required to service complex quartz analog, digital and duo display watches, including chronographs and perpetual calendars with multiple step motors and ultrasonic step motor calendar driving systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21001	Replace watch batteries, capacitors and bands
MEM21002	Perform watch movement exchange
MEM21005	Diagnose faults in quartz watches
MEM21006	Service quartz watches

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify watch functions and features
		1.4	Prepare written quotation and inform customer of watch condition and performance concerns
		1.5	Outline recommended service procedures to be undertaken to remedy identified faults
		1.6	Verify and agree on servicing requirements with customer
		1.7	Prepare watch for handover
		1.8	Record and document repair process
2	**Disassemble complex quartz watch cases, movements and components**	2.1	Establish appropriate working environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Select and use appropriate workshop tools and equipment
		2.4	Open and close watch cases
		2.5	Remove case components and movement without damaging or marking
		2.6	Verify gasket condition and replace, as required
		2.7	Clean cases and bands, as required
3	**Service complex quartz watch case and movement components**	3.1	Inspect condition of movement and case components
		3.2	Confirm servicing requirements
		3.3	Replace faulty or worn component parts
		3.4	Clean and inspect watch case and components for cleanliness and rectify imperfections and faults

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4	**Reassemble and test complex quartz watches**	4.1 Reassemble multiple step motors, perpetual calendar mechanisms, watch movement and case components
		4.2 Perform work according to manufacturer guidelines and specifications
		4.3 Confirm correct assembly and operation of gear train and perpetual calendar driving system
		4.4 Use correct types and amounts of lubricant
		4.5 Use specialist service tools, jigs and testing equipment
		4.6 Verify watch functioning of calendar and chronograph mechanisms
		4.7 Verify and adjust watch performance and rate testing
		4.8 Perform resetting and zeroing and synchronising of chronograph and perpetual calendar displays

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Complex quartz watch functions and features include one (1) or more of the following:	• chronograph • perpetual calendar • repeater • perpetual calendar with multiple step motors • ultrasonic step motor calendar driving systems

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Record and document repair process includes one (1) or more of the following:	• customer written quotation detailing faults • recommendations of most appropriate service procedure • cost estimation of replacement part • time spent on procedure
Appropriate working environment includes the following:	• suitable watchmakers' bench • clean and orderly work area (precautions taken to minimise dust) • suitable lighting and adequate ventilation • ergonomic chair with adjustable height
Workshop tools and equipment include one (1) or more of the following	• timing machine • multimeter • pulse generator • watch repair and construction hand tools • case opening and closing tools • cleaning media • cleaning machines • lubricants • PPE
Case components include one (1) or more of the following:	• watch glasses • case back • bezel • crown • pendant • pushbuttons (arbors and circlips) • gaskets
Watch performance/rate testing includes one (1) or more of the following:	• current consumption (to manufacture specifications) • pulse generation • lower working limit test • gear train freedom • types of quartz regulating systems (capacitive, inhibition and thermo-compensation) • rate adjustment for various types of quartz watch (+0.25 - 0.3 seconds/day)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21007A Service complex quartz watches

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Assessment Requirements for MEM21007 Service complex quartz watches

Modification History

Release 1. Supersedes and is equivalent to MEM21007A Service complex quartz watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer and verifying condition and performance, identifying service costs, and recording and documenting repair process
- dismantling complex quartz watches, chronographs and perpetual calendars using appropriate workshop tools and equipment
- servicing multiple step motors in quartz chronograph and perpetual calendar watches in an appropriate work environment
- fault finding complex quartz watches and identifying faulty or worn components and replacing in accordance with manufacturers' specifications
- reassembling, lubricating, performance testing and adjusting complex quartz watches
- re-programming and resetting integrated circuits and synchronising analog displays for quartz chronographs and perpetual calendars.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- quartz watch construction, components and operating principles, including calendars and motor drive systems
- service procedures for complex analog and digital quartz watches
- client liaison techniques
- fault-finding techniques for quartz watches
- performance testing equipment/procedures
- types of calendar displays
- service procedures to program and reset chronograph and perpetual calendar circuits.

Assessment Conditions

- Assessors must:

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  - have vocational competency in servicing complex quartz watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21008 Service mechanical watches

Modification History

Release 1. Supersedes and is equivalent to MEM21008A Service mechanical watches

Application

This unit of competency defines the skills and knowledge required to service mechanical watches, including movements, sub-assemblies and components. It covers common servicing requirements for mechanical watches undertaken by all watch repairers.

Where work beyond normal servicing requirements is required unit MEM21009 Inspect, diagnose, adjust and repair mechanical watches should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify watch type, functions, construction and components
		1.4	Carry out pre-repair tests to verify water resistance, as required
		1.5	Prepare written quotation and inform customer of watch condition, completeness and performance concerns
		1.6	Outline recommended service procedures to be undertaken to remedy identified faults
		1.7	Verify and agree on servicing requirements with customer
		1.8	Prepare watch for handover
		1.9	Record and document repair process
2	**Disassemble watch, case and movement components for servicing**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Open and close watch cases
		2.4	Use hand tools and equipment in safe and correct manner
		2.5	Remove case components and movement sub-assemblies in correct sequence without damaging or marking
		2.6	Verify condition of case gaskets and replace, as required
		2.7	Clean watch case and band, as required
3	**Service watch case, movement,**	3.1	Inspect condition of movement, sub-assemblies and case components

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	sub-assemblies and components	3.2	Confirm servicing requirements
		3.3	Replace faulty or worn component parts/movement, sub-assemblies or case
		3.4	Select appropriate cleaning methods and clean components
		3.5	Inspect watch case and components for cleanliness and rectify imperfections and faults
4	**Reassemble watch, movement and case components**	4.1	Reassemble watch movement and case components according to manufacturer specifications
		4.2	Assemble motion work and verify and adjust hand setting tension
		4.3	Check and adjust component operation and watch functioning
		4.4	Lubricate components and sub-assemblies according to manufacturer specification
		4.5	Apply watch assembly inspections and precautions
5	**Test and adjust watch function and performance**	5.1	Verify function of watch movement and sub-assemblies
		5.2	Correctly set up and operate mechanical watch timing machine and interpret readings
		5.3	Verify watch performance and rate testing and adjust according to manufacturer specifications, as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch type, function, construction and components include one (1) or more of the following:	• manual wound • shock-resistance system • regulating system • power reserve indicator • mainspring • gear train • escapement • oscillator • winding and setting
Function and operating principles of mechanical watches include the following:	• shock resistance system • regulating systems (conventional, free sprung and Etachron) • mainsprings as generators of power motive force • gear train to transmit power • escapement to release power • oscillator to control the speed of release of power • winding and setting to wind watch and set hands to time
Record and document repair includes one (1) or more of the following:	• extent and date of repair • cost of replacement part • time spent on procedure
Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment are organised and in good condition • ergonomic seating • ventilation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Case components and movement sub-assemblies include one (1) or more of the following:	• glass and bezel • case back and gaskets • crown, pendant and gaskets • balance and cock assembly • pallet and escapement components • barrel and mainspring assembly • gear train • winding and setting mechanisms
Inspect condition includes inspection of the following:	• originality of components • corrosion • cleanliness • wear
Cleaning methods include one (1) or more of the following:	• conventional • ultrasonic • vibrational • hand cleaning • types of watch cleaning solutions used • precautions for handling and disposing cleaning solutions
Verify and adjust hand setting tension includes one (1) or more of the following:	• test for correct friction • conventional cannon pinions • friction driving wheel • short off centre
Watch assembly inspections and precautions include one (1) or more of the following:	• winding and setting engagement, operation and lubrication • gear train end shake, backlash and lubrication • mainspring engagement, hooking, tension and lubrication • escapement action, operation e.g. pallet jump and lubrication • oscillator end shake, balance spring condition and correct amount lubrication
Mechanical watch timing machine includes the following:	• Witschi watch expert or equivalent giving an indication of rate in seconds a day, beat error and amplitude

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch performance and rate testing includes one (1) or more of the following:	• in-beat under 0.5 milliseconds • rate adjustment +/- 10 seconds per day • amplitude minimum 220 - 270 degrees fully wound

Hand tools and equipment include one (1) or more of the following:	• timing machine
	• case opening/closing tools
	• oilers and oil pots
	• hand cleaning tools:
	  • pith
	  • peg wood
	  • rodico
	  • solvents jar

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21008A Service mechanical watches

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21008 Service mechanical watches

Modification History

Release 1. Supersedes and is equivalent to MEM21008A Service mechanical watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying various mechanical watches by function, escapement and quality
- liaising with customer, verifying condition and performance and identifying repair costs
- dismantling watch case and movement components for servicing in an appropriate work environment
- inspecting condition of case components and movement sub-assemblies for originality of components, corrosion, cleanliness and wear
- servicing watch case, movement, sub-assemblies by replacing faulty or worn component parts and selecting appropriate cleaning method
- using appropriate hand tools and equipment in carrying out service in a clean and safe work environment
- reassembling watch, movement and case components and verifying and adjusting hand setting tension
- applying correct amount and type of lubrication in accordance with manufacturers' specifications
- undertaking function and watch performance and rating tests
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of mechanical watches by function, escapement and quality
- function and operating principles of mechanical watches
- component parts of a mechanical watch mechanism
- manufacturer specification and tolerances for lubrication, performance and time keeping
- dismantling/reassembling techniques of watch movements according to procedures and manufacturer guidelines

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- watch cleaning methods
- techniques for servicing mechanical watches
- band construction and components.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing mechanical watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21009 Inspect, diagnose, adjust and repair mechanical watches

Modification History

Release 1. Supersedes and is equivalent to MEM21009A Inspect, diagnose, adjust and repair mechanical watches

Application

This unit of competency defines the skills and knowledge required to inspect and evaluate the condition of mechanical watches, diagnose problems, make repairs and adjust mechanical watch movements and sub-assemblies.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify watch construction, function and characteristics
		1.4	Source manufacturer technical guidance information to determine correct tolerances and specifications
		1.5	Prepare watch for handover
		1.6	Record and document repair process
2	**Inspect mechanical watches**	2.1	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.2	Undertake inspections of watch movements in accordance with manufacturer tolerances and procedures
		2.3	Make accurate observations of the condition and function of components and sub-assemblies
		2.4	Remove and replace components and sub-assemblies in a sequence designed to accurately assess condition and faults during the process of dismantling and assembling
		2.5	Inspect lubrication quantity and condition
3	**Diagnose faults in mechanical watches**	3.1	Evaluate observations and watch performance characteristics to determine appropriate repair procedure
		3.2	Analyse timekeeping performance using appropriate techniques and equipment
		3.3	Make alterations in a logical sequence to diagnose faults
4	**Repair and adjust mechanical watches**	4.1	Select and use appropriate hand tools
		4.2	Undertake dismantling and reassembling of watch movements according to industry standard procedures

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			and manufacturer guidelines
		4.3	Make precise corrections to sub-assemblies
		4.4	Remove, dismantle, replace and reassemble sub-assemblies and components in correct order without damaging or marking
		4.5	Select appropriate replacement components
5	**Test and adjust watch function and performance**	5.1	Verify and confirm function of watch movement and sub-assemblies
		5.2	Verify watch performance and rate testing
		5.3	Adjust, as required, according to manufacturer specifications
		5.4	Repeat testing, as required, to confirm performance
6	**Apply industry workshop standards to perform work**	6.1	Use hand tools and equipment in a safe and correct manner
		6.2	Handle components without damaging or marking
		6.3	Establish a clean and safe work environment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch construction, function and characteristics include one (1) or more of the following:

- mainspring variation of motive force
- gear train freedom, including:
  - end shakes
  - side shakes
  - backlash
- escapement operation performance
- oscillator amplitude, balance spring positional changes and influences
- winding and setting mechanisms

Condition and faults include one (1) or more of the following:

- end shakes, side shakes and clearances of operating components
- oscillators balance spring condition, shock protection operation, condition and component replacement
- functioning, clearances and safety action of the escapement system
- mainspring and barrel assembly condition
- gear train (including pivot, pinions or bearings conditions - wear and corrosion)
- winding and setting components (wear and end shake freedom)
- lubrication including type, application, quantity and cleanliness

Timekeeping performance includes one (1) or more of the following:

- regulating system components adjustment
- balance spring condition, including:
  - flat
  - concentric
  - beating evenly between curb pins
- beat error diagnosis and adjustment

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Sub-assemblies and components include one (1) or more of the following:	• balance and cock assembly • escapement components • barrel and mainspring assembly • gear train • winding and setting mechanisms, including motion work and canon pinion • hand setting tension • shock-resistance system • calendar, winding system and other mechanisms • power reserve
Watch performance/rate testing includes one (1) or more of the following:	• in-beat adjustment without movable stud holder • rate adjustment • amplitude evaluation of watches performance
Hand tools and equipment include one (1) or more of the following:	• timing machine • staking set • jewel press • eyeglass, screwdrivers and tweezers • case opening and closing tools
Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment are organised and in good condition • ergonomic seating • ventilation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21009A Inspect, diagnose, adjust and repair mechanical watches

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21009 Inspect, diagnose, adjust and repair mechanical watches

Modification History

Release 1. Supersedes and is equivalent to MEM21009A Inspect, diagnose, adjust and repair mechanical watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying various mechanical watches by construction, function and characteristics
- liaising with customer, verifying condition and performance, and identifying repair costs
- inspecting mechanical watches by manipulating components and sub-assemblies and assessing condition and faults during the process of dismantling and assembling
- interpreting readings and making accurate observations to recognise faults
- determining appropriate sequence to accurately assess condition and faults during the process of dismantling and assembly
- selecting and using appropriate bench tools when repairing and adjusting mechanical watches in a clean and safe environment
- undertaking inspection and adjustment of watch mechanisms and sub-assemblies
- performing timekeeping analysis and adjustment techniques
- undertaking function and watch performance and rate tests
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- mechanical watch faults
- sequences used to accurately assess condition and faults during the process of dismantling and assembly
- tools used to repair and adjust mechanical watches
- adjustment methods for watch mechanisms and sub-assemblies
- watch performance and rate test requirements
- repair and adjustment procedures
- repair records and documentation procedures

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- function and operating principles of mechanical watches
- procedures for fault finding and inspection of watch mechanisms and sub-assemblies
- manufacturer specifications and tolerances for performance and timekeeping.

Assessment Conditions

- Assessors must:
  - have vocational competency in inspecting, diagnosing, adjusting and repairing mechanical watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21010 Service watch power generating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21010A Service watch power generating systems

Application

This unit of competency defines the skills and knowledge required to service and repair mechanical self-winding (automatic) watches and quartz watch power generating systems, service components, and adjust and test mechanisms for optimum performance.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Inspect watch condition and performance concerns
		1.4	Prepare written and verbal quotations
		1.5	Agree with customer on recommended service procedures to remedy faults
		1.6	Identify mechanical self-winding or quartz generating system type
		1.7	Prepare watch for handover
		1.8	Record and document repair process
2	**Disassemble and reassemble self-winding or quartz generating mechanisms**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Open and close self-winding or quartz generating watch cases
		2.4	Use hand tools and equipment in safe and correct manner
		2.5	Remove and replace case components, dial and hands, movements and sub-assemblies in correct sequence without damaging or marking
		2.6	Verify condition of case pushbuttons and gaskets and replace, as required
		2.7	Clean cases and bands, as required
		2.8	Apply dismantling and assembly precautions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Service and adjust self-winding or quartz generating watch mechanisms**	3.1	Inspect condition of self-winding or quartz generating watch mechanisms
		3.2	Lubricate components and sub-assemblies according to manufacturer specification
		3.3	Replace faulty or worn component parts
		3.4	Clean self-winding or quartz generating watch mechanism components
		3.5	Inspect self-winding or quartz generating mechanism for cleanliness and rectify imperfections or faults
		3.6	Adjust self-winding or quartz generating mechanism components for correct operation, end shake and clearances
4	**Test and adjust self-winding or quartz generating mechanism function and performance**	4.1	Perform pre-service inspection and fault finding of self-winding or quartz generating mechanism action, function and wrist sensitivity
		4.2	Verify watch performance/rate testing and amplitude
		4.3	Perform simulated wear and power generation tests, as appropriate

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

System type and construction include one (1) or more of the following:

- mechanical self-winding
- quartz watch power generation, including:
  - kinetic quartz
  - auto quartz
- types of construction, including:
  - rotor
  - buffer
  - pedometer
  - case winding
- features of construction, including:
  - single-way winding
  - two-way winding
- performance characteristics (constant motive force)

Record and document repair process includes one (1) or more of the following:

- extent and date of repair
- cost of replacement part
- time spent on procedure

Dismantling and assembly precautions include one (1) or more of the following:

- sequence of inspection and adjustment of self-winding or quartz generating mechanism
- verification of correct operation of oscillating weight, reversing wheel and mainspring slipping device
- correct selection, application and amount of lubrication for self-winding or quartz generating mechanism

Faulty or worn component parts include one (1) or more of the following:

- oscillating weight ball bearings
- rotor posts
- reversing wheel pivots
- clicks
- slipping bridle
- driving gear
- friction clutch
- generating rotor

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Self-winding or quartz generating components include one (1) or more of the following:	• oscillating weights and rotor • transmissions, reverser wheels and wig wag • mainspring and barrel • slipping devices
Watch performance/rate testing includes one (1) or more of the following:	• beat error diagnosis and adjustment • rate adjustment • amplitude
Wear and power generation tests include one (1) or more of the following:	• machine simulation wear test • testing by wrist wearing • kinetic voltage test
Hand tools and equipment include one (1) or more of the following:	• timing machine • mainspring winders • cyclomat • case opening and closing tools
Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • organised tools and equipment • ergonomic seating

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21010A Service watch power generating systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21010 Service watch power generating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21010A Service watch power generating systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying mechanical self-winding or quartz generating system type
- liaising with customer, verifying condition and performance, and identifying repair costs
- selecting and using appropriate tools and equipment in a clean and safe environment
- identifying and naming the components of a self-winding or quartz generating mechanism
- dismantling and assembling self-winding or quartz generating mechanisms using correct techniques and precautions
- inspecting, fault finding and replacing faulty or worn components
- cleaning components and applying lubricants correctly in an appropriate work environment
- servicing barrel and mainspring slipping device in accordance with procedures
- undertaking function and watch performance and rate tests
- performing wear and power generation tests
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of self-winding or quartz generating watch
- components of a self-winding or quartz generating mechanism
- inspection and fault-finding procedures of self-winding or quartz generating mechanisms
- lubrication techniques of self-winding or quartz generating mechanisms
- function of the barrel and mainspring slipping device
- performance tests for self-winding or quartz generating mechanisms.

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Assessment Conditions

- Assessors must:
  - have vocational competency in servicing watch power generating systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21011 Service calendar and other dial indication mechanisms for watches

Modification History

Release 1. Supersedes and is equivalent to MEM21011A Service calendar and other dial indication mechanisms for watches

Application

This unit of competency defines the skills and knowledge required to service and repair watches with different types or combinations of calendar and other dial indications. This work is often performed in conjunction with major servicing on both mechanical and quartz watches.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches
MEM21010	Service watch power generating systems

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify watch type, calendar construction and dial indicator components
		1.4	Inspect condition and functions of calendar operation and dial indicator mechanisms, including creeping, semi-instantaneous, instantaneous, retrograde and rapid corrector
		1.5	Prepare watch for handover
		1.6	Record and document repair requirements
2	**Dismantle and reassemble calendar and dial indication mechanisms**	2.1	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.2	Select and use appropriate workshop tools and equipment
		2.3	Open and close watch cases
		2.4	Dismantle and reassemble calendar and dial indication mechanisms according to design and construction constraints
3	**Service and verify calendar and dial indication mechanisms**	3.1	Identify calendar and dial indications drive mechanism
		3.2	Identify faults and repair or replace worn or damaged component parts
		3.3	Clean components using appropriate methods
		3.4	Inspect correct fitting and function of all components
		3.5	Verify sequencing and alignment of components during reassembly, including dial and hand fitting
		3.6	Lubricate components according to manufacturer

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	specifications
	3.7 Test calendar and dial indications will not impact on watch performance, amplitude or timekeeping

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Watch type, calendar construction and dial indication components include one (1) or more of the following:	• date indications:
	  • day/date
	  • day/date/month
	• moon phase and year indicators
	• annual calendar
	• perpetual calendar
	• power reserve indicator
	• equation of time

Record and document repair includes one (1) or more of the following:	• date and extent of repair • cost of replacement part • time spent on procedure

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Workshop tools and equipment include one (1) or more of the following:	• hand tools:
	  • tweezers
	  • screwdrivers
	  • eyeglasses
	• hand fitting pushers
	• stakes
	• presses

Calendar and dial indications drive mechanism include one (1) or more of the following:	• creeping • semi-instantaneous • instantaneous • retrograde • rapid corrector
Correct fitting and functions include one (1) or more of the following:	• end shake of components • clearances of moving parts • penetrations of calendar drive wheel mechanism and finger • spaces • safety features • calendar change operation at midnight • calendar action • rapid corrector engagement and operation • calendar day and date mechanisms

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21011A Service calendar and other dial indication mechanisms for watches

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21011 Service calendar and other dial indication mechanisms for watches

Modification History

Release 1. Supersedes and is equivalent to MEM21011A Service calendar and other dial indication mechanisms for watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer, verifying condition and performance, and identifying repair costs
- dismantling, reassembling and lubricating calendar mechanisms using appropriate workshop tools and equipment
- servicing and fault finding and addressing faults in calendar watches and ensuring correct fitting and functions
- performing inspection and adjustment of calendar change mechanism
- applying correct amount and type of lubrication in accordance with manufacturer's specifications
- synchronising dial indications with calendar change mechanism
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of calendar watches
- types of calendar drive mechanism operation
- power reserve indicator construction and operation
- calendar/dial indications component part names
- repair/replacement options for calendar and dial indication mechanisms
- lubrication techniques for calendar and dial indication mechanisms
- fault-finding and inspection techniques of calendar and dial indication mechanisms.

Assessment Conditions

- Assessors must:

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  - have vocational competency in servicing calendar and other dial indication mechanisms for watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM21012 Service and repair mechanical watch oscillating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21012A Service and repair mechanical watch oscillating systems

Application

This unit of competency defines the skills and knowledge required to apply service and repair techniques and procedures for balance staff replacement of mechanical watch oscillating systems and components.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify oscillator types**	2.1	Identify oscillating construction types and components
		2.2	Establish the performance characteristics of the watch oscillating system
		2.3	Record and document repair requirements
3	**Diagnose oscillator condition**	3.1	Select and use appropriate workshop tools and equipment
		3.2	Inspect oscillator components for condition, function, end shake and performance
		3.3	Record and report wear and damage to component parts
		3.4	Determine appropriate repair process to rectify faults
4	**Repair, replace and adjust oscillator components**	4.1	Remove and reassemble balance complete and oscillator components using appropriate tools, equipment and techniques
		4.2	Determine type and method of balance staff removal and replacement
		4.3	Test security of replacement balance staff and oscillator components
		4.4	Inspect condition and adjust balance wheel and oscillator components for correct operation

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
	4.5	Determine type of roller and roller jewel and the method of removal and replacement procedures
	4.6	Inspect, diagnose and adjust balance spring to achieve optimum performance and timekeeping
	4.7	Inspect, service and replace components for shock protection devices fitted to mechanical oscillators
5 **Test and adjust oscillator**	5.1	Verify and confirm function of watch movement
	5.2	Set up and operate mechanical watch timing machine and interpret readings
	5.3	Verify watch performance and timekeeping
	5.4	Adjust in-beat and rate, as required, according to performance and design characteristics

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Oscillator construction types include one (1) or more of the following:	• roskoph • nickel • glycudur • chronometer • 2, 3, 4 arms • bi-metal compensating • annular • balance spring • tourbillion
Oscillator components include one (1) or more of the following:	• balance wheel • balance spring • balance staff • roller • roller jewel
Performance characteristics include one (1) or more of the following:	• timing and certified chronometer • effects of temperature, shocks, magnetism and position of wear • temperature compensation
Record and document repair includes one (1) or more of the following:	• extent and date of repair • cost of replacement part • time spent on procedure
Workshop tools and equipment include the following:	• hand tools • levers • roller removing tool • staking set • watchmaker's lathe • balance wheel truing tool • poising tool • figure of eight calipers • spirit lamp • presto roller jewel fitting tool

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Oscillator components include one (1) or more of the following:

- balance wheel
- balance spring
- balance staff
- roller
- roller jewel

Type of construction includes one (1) or more of the following:

- balance staff:
  - friction fitted
  - riveted
  - screwed
- roller:
  - single table
  - double table
  - incabloc
  - two piece
- roller jewel shape:
  - D shape
  - triangular
  - elliptical
- balance spring:
  - flat
  - overcoil
  - helical
  - spherical
  - conical

Wear and damage includes one (1) or more of the following:

- balance staff pivots bent, scored or worn
- balance wheel out of true, damaged or enlarged hole
- roller tables deformed or damaged
- roller jewel cracked, chipped or missing
- balance spring centred flat, at the cock and collet

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate repair process includes one (1) or more of the following:	• consideration of component cost and availability • replace balance complete and balance staff • repair or replace balance spring and roller • dismantling and reassembling techniques • inspections adjustments of components • lubrication techniques, type and quantity • use of stop oil treatments
Type and method of balance staff removal and replacement includes one (1) or more of the following:	• friction fit • riveted • screwed • turning rivet/hub on lathe • knock out staking set • grinding molfre tool • shock-resistance
Correct operation includes one (1) or more of the following:	• balance staff secure fitting/tightness • roller aligned and secure • balance wheel true and static poised • balance spring stud location in-beat • balance spring adjusting and balance staff end shakes
Type of roller and roller jewel includes one (1) or more of the following:	• single and double tables • two piece, shock-resistance • D shaped, triangular or elliptical roller jewels
Components of shock protection devices include one (1) or more of the following:	• jewels • endstones • combined setting • shock spring
Watch performance includes one (1) or more of the following:	• in-beat 0.5 ms • amplitude (minimum 220 – 270 degrees, variations in positional errors) • rate +/- 5 – 10 seconds a day

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21012A Service and repair mechanical watch oscillating systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21012 Service and repair mechanical watch oscillating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21012A Service and repair mechanical watch oscillating systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer, verifying condition and performance, and identifying repair costs
- identifying different types and grades of mechanical watch oscillating systems
- diagnosing faults in mechanical watch oscillating systems for wear and damage and determining appropriate repair action
- inspecting and repairing faults in mechanical watch oscillating systems using appropriate workshop tools and equipment
- repairing a mechanical watch with broken or worn balance staff utilising type and method of balance staff removal and replacement
- inspecting and adjusting oscillator components for optimum performance in accordance with specifications
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types and grades of balance wheel construction
- types of balance staffs construction
- types of balance spring construction
- types of rollers and roller jewels construction
- balance staff replacement techniques and workshop procedures
- performance characteristics of balance wheel completes
- balance spring adjusting techniques
- operating principles of shock protection devices
- construction of shock protection devices
- watch servicing procedures and techniques.

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Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing mechanical watch oscillating systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21013 Service, test and adjust watch escapements

Modification History

Release 1. Supersedes and is equivalent to MEM21013A Service, test and adjust watch escapements

Application

This unit of competency defines the skills and knowledge required to inspect watch escapement components and operation, diagnose and rectify faults, replace components and adjust action to achieve optimum timekeeping performance for a watch escapement.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches
MEM21012	Service and repair mechanical watch oscillating systems

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Inspect watch escapement condition**	2.1	Identify escapement type and construction
		2.2	Inspect escapement components and condition
		2.3	Observe escapement action for faults
		2.4	Perform and confirm safety test action
		2.5	Record and document repair process
3	**Repair, replace and adjust watch escapement components**	3.1	Establish an appropriate clean and safe work environment
		3.2	Use hand tools and equipment in safe and correct manner
		3.3	Handle components without damaging or marking
		3.4	Adjust or replace components, as necessary
		3.5	Adjust pallet stones and banking pins for optimum performance
		3.6	Reconfirm safety test action
4	**Test and adjust escapement function and**	4.1	Verify and confirm escapement function and lubrication
		4.2	Confirm escapement performance by assessing oscillator amplitude to manufacturer specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
performance	4.3 Reconfirm safety test action
	4.4 Assess watch in various states of winding and position
	4.5 Make adjustments to achieve performance within specification, as necessary

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment type and construction includes one (1) or more of the following:	• recoil • frictional rest • detached • lever (Swiss or English) • co-axial • dual direct • chronometer (spring or pivoted detent) • cylinder • pin pallet • verge • duplex • semi-tangential • equidistant • circular

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Escapement components and conditions include one (1) or more of the following:	• escape wheel • lever • jewel pallet stones • fork • guard pin • roller and jewel • banking pins • alignment, division and end shake of escapement components
Safety test action includes one (1) or more of the following:	• clearance of horns • clearance of guard pin
Record and document repair includes one (1) or more of the following:	• extent and date of repair • cost of replacement part • time spent on procedure

Hand tools and equipment include one (1) or more of the following:	• escapemeter
	• pallet stone warmer (spirit lamp or electric warmer)
	• shellac
	• banking pin adjusting tools
	• timing machine
	• staking tool
	• watch servicing hand tools:
	  • roller remover
	  • escapement files
	  • burnishers
	  • levers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment are organised and in good condition • ergonomic seating • ventilation

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21013A Service, test and adjust watch escapements

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21013 Service, test and adjust watch escapements

Modification History

Release 1. Supersedes and is equivalent to MEM21013A Service, test and adjust watch escapements

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying escapement type and construction
- liaising with customer, verifying condition and performance, and identifying repair costs
- establishing a clean and safe work environment
- identifying faults in escapement components and condition
- rectifying escapement action by replacement and adjustment using appropriate hand tools and equipment
- servicing/lubricating escapement in accordance with manufacturer's specifications
- reconfirming safety test action including clearance of horns and clearance of guard pin and assessing watch in various states of winding and position
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- watch construction
- historic development and common types of escapements
- lever escapement function, operation, action, inspection and adjustment
- escapement safety tests
- techniques for replacement/adjustment of pallet stones
- techniques for assessing watch escapement performance/timekeeping.

Assessment Conditions

- Assessors must:

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  - have vocational competency in servicing, testing and adjusting watch escapements at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21014 Service mechanical chronograph watches

Modification History

Release 1. Supersedes and is equivalent to MEM21014A Service mechanical chronograph watches

Application

This unit of competency defines the skills and knowledge required to apply servicing techniques to mechanical chronograph watches, including sub-assemblies and case components, to ensure optimum performance and timekeeping.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 6

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches
MEM21010	Service watch power generating systems
MEM21011	Service calendar and other dial indication mechanisms for watches

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify type of chronograph watch mechanisms and components
		1.4	Prepare written quotation and inform customer of watch condition and performance concerns, outlining recommended service procedures to be undertaken to remedy identified faults
		1.5	Verify and agree on servicing requirements with customer
		1.6	Prepare watch for handover
		1.7	Record and document repair process
2	**Disassemble and reassemble chronograph watches**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Open and close chronographs watch cases
		2.4	Use hand tools and equipment in safe and correct manner
		2.5	Remove and replace case components, dials and hands, movements and sub-assemblies in correct sequence without damaging or marking
		2.6	Verify condition of case pushbuttons, operation and gaskets and replace, as required
		2.7	Clean cases and bands, as required
		2.8	Apply dismantling and assembly precautions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Service and adjust chronograph mechanisms**	3.1	Inspect condition of chronograph components
		3.2	Lubricate chronograph mechanism with correct type and amount according to manufacturer specifications
		3.3	Replace faulty or worn components
		3.4	Clean chronograph components
		3.5	Inspect chronograph watch for cleanliness and rectify imperfections and faults
		3.6	Adjust chronograph components for correct end shake, clearances and penetrations
4	**Test and adjust chronograph watch function and performance**	4.1	Perform pre-service inspection and fault-finding of chronograph action, function and depthings
		4.2	Verify and confirm dial and hand fitting, and casing up of chronograph
		4.3	Verify watch performance and rate testing
		4.4	Perform final adjustment and correction of recording and zeroing mechanism

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Chronograph watch mechanisms include one (1) or more of the following:

- types - application of dial scale indications:
  - tachymeter
  - telemeter
- chronograph operating systems:
  - pillar wheel actuated
  - cam controlled
- features:
  - minute record
  - hour record
  - automatic
  - split second

Appropriate working environment includes the following:

- adequate lighting and ventilation
- clean bench and working area
- tools and equipment organised and in good condition
- ergonomic seating

Record and document repair includes one (1) or more of the following:

- date and extent of repair
- cost of replacement part
- time spent on procedure

Dismantling and assembly precautions include one (1) or more of the following:

- inspection of condition and adjustments of chronograph assembly functions
- verification of correct recording system operation:
  - engagement
  - depthing
  - end shake
  - penetration
- correct selection, application and amount of lubrication for chronograph mechanisms
- adjustment of timekeeping performance and balance amplitude during chronograph function

Chronograph components include one (1) or more of the following:

- operating mechanism (single or double pusher action)
- clutch system for chronograph engagement
- transmission (minute or hour record)
- flyback and zeroing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Chronograph action includes one (1) or more of the following:	• start, stop, reset to zero • hand zeroing • indexing minute and hour record
Dial and hand fitting includes one (1) or more of the following:	• hand fitting tools and supports • alignments and synchronisation
Watch performance and rate testing includes one (1) or more of the following:	• beat error diagnosis and adjustment • rate adjustment/positional errors • amplitude (chronograph start - maximum variation +/- 40 degrees)
Hand tools and equipment include one (1) or more of the following:	• movement holders for operating chronograph functions • timing machine • rose cutters • tools for removing chronograph driving wheel • hand staking and fitting tools and supports • case opening and closing tools

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21014A Service mechanical chronograph watches

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21014 Service mechanical chronograph watches

Modification History

Release 1. Supersedes and is equivalent to MEM21014A Service mechanical chronograph watches

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying type of chronograph watch mechanisms and components
- liaising with customer, verifying condition and performance, and identifying repair costs
- dismantling, assembling and cleaning chronograph watches using correct techniques in an appropriate work environment
- inspecting, fault finding and adjusting chronograph mechanisms and components
- using appropriate hand tools and equipment to carry out service in accordance with procedures
- performing function and performance testing of chronograph action
- performing chronograph dial and hand fitting, including hand fitting tools and supports, and alignment and synchronisation
- selecting and applying lubricants in accordance with manufacturers' specifications
- verifying watch
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- basic functions and operations of the chronograph or stop watch
- identification of the component parts of a chronograph watch mechanism
- pre-service inspection and fault-finding techniques for chronograph action, function and depthings
- inspections and adjustments techniques of mechanical chronograph mechanisms
- dismantling/reassembling techniques for mechanical chronograph watches in accordance with procedures and manufacturer guidelines
- manufacturer specification and tolerances for lubrication, performance and timekeeping

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- chronograph watch case construction, and pushbuttons and pendants servicing
- band construction and components.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing mechanical chronograph watches at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21015 Perform precision watch timing and adjustment

Modification History

Release 1. Supersedes and is equivalent to MEM21015A Perform precision watch timing and adjustment

Application

This unit of competency defines the skills and knowledge required to make fine adjustments to high-grade mechanical watches in order to achieve precision timing (chronometer performance).

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 6

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches
MEM21012	Service and repair watch oscillating systems
MEM21013	Service, test and adjust watch escapements

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify high-grade mechanical watch characteristics
		1.4	Prepare written quotation and inform customer of watch condition and performance concerns, outlining recommended service procedures to be undertaken to remedy identified faults and accuracy of timekeeping
		1.5	Verify and agree on servicing requirements with customer
		1.6	Prepare watch for handover
		1.7	Record and document repair process
2	**Analyse watch performance**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Use hand tools and equipment in safe and correct manner
		2.4	Handle components without damaging or marking
		2.5	Assess condition and ability of watch to achieve chronometer performance
		2.6	Conduct performance analysis of mechanical watch
		2.7	Adapt servicing techniques to meet manufacturer performance specifications (chronometer certified rating)
		2.8	Assess oscillator and balance spring condition
		2.9	Analyse positional errors in mechanical watch

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Adjust mechanical watch performance**	3.1	Adjust mechanical watch to minimise positional errors
		3.2	Adjust mechanical watch to minimise variations in balance amplitude/performance/rate
		3.3	Adjust oscillator and balance spring to minimise positional errors and perform dynamic poising
		3.4	Repeat and confirm all adjustments
4	**Test mechanical watch function and performance**	4.1	Verify instantaneous watch performance and rate testing
		4.2	Perform longitudinal testing to confirm watch performance
		4.3	Determine intermittent timing faults and adjustments

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

High-grade mechanical watch characteristics include one (1) or more of the following:

- finish of components:
  - bevelling
  - graining
  - level of polish
- type of materials used for movement and case construction:
  - non-magnetic alloys
  - precious metals
- quality of components used:
  - balance spring
  - escapement
  - balance wheel
- certification chronometer
- brand name
- number of jewels

Record and document repair includes one (1) or more of the following:

- date and extent of repair
- cost of replacement part
- time spent on procedure

Performance analysis includes one (1) or more of the following:

- watch subjected to various testing positions:
  - dial up
  - dial down
  - crown up
  - crown down
  - crown right
  - left
- states of winding:
  - partly wound
  - half wound
  - fully wound
- temperature variation
- factors affecting isochronism (equal time of vibration)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Oscillator and balance spring condition includes one (1) or more of the following:	• static poise of balance wheel:
	  • balance spring condition
	  • concentric
	  • flatness
	  • beating evenly between curb pins

Dynamic poising includes one (1) or more of the following:	• set up and determine out-of-poise/balance wheel using a timing machine • identify and locate point of adjustment • methods of adjustment (with cutters or milling tools)
Confirm all adjustments includes the following:	• ensuring required accuracy is obtained and timekeeping is in accordance with manufacturer specifications
Watch performance and rate testing includes one (1) or more of the following:	• in-beat • rate adjustment • amplitude • effect or influence of escapement • temperature • effect of positional errors • effect of balance wheel poise • effect of balance spring • states of winding
Longitudinal testing includes the following:	• testing over extended time period by wearing or simulator machine
Hand tools and equipment include one (1) or more of the following:	• mechanical watch timing machine • poising tools • balance wheel cutters • case opening and closing tools
Working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment organised and in good condition • ergonomic seating

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21015A Perform precision watch timing and adjustment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21015 Perform precision watch timing and adjustment

Modification History

Release 1. Supersedes and is equivalent to MEM21015A Perform precision watch timing and adjustment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying high-grade mechanical watch characteristics
- liaising with customer and verifying condition and performance
- identifying repair costs and preparing written quotation for service/repair
- servicing high-grade mechanical watches to achieve original manufacturer timekeeping standards and specifications in an appropriate work environment
- using appropriate hand tools and equipment to carry out precision watch timing and adjustments
- conducting watch performance testing and longitudinal testing
- analysing and interpreting results of watch performance testing and adjusting and rectifying errors in watch oscillating system
- conducting dynamic poising adjustment of balance wheel
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of high-grade mechanical watches by brand and complications
- characteristics of high-grade mechanical watch movements/components
- timekeeping accuracy for chronometers
- watch construction and components
- oscillator pivot friction and end shake adjustment
- positional error variation adjustments for mechanical watches
- balance amplitude/performance/rate variation adjustments for mechanical watches
- influence of out-of-poised balance wheel
- influence of the escapement on timekeeping
- influence of the balance spring design/characteristics on timekeeping

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- balance spring inspection and adjustment techniques
- performance testing procedures for mechanical watches
- factors affecting isochronism
- workshop procedures for conducting dynamic poising.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing precision watch timing and adjustment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21016 Install and set up clocks

Modification History

Release 1. Supersedes and is equivalent to MEM21016A Install and set up clocks

Application

This unit of competency defines the skills and knowledge required to set up and assemble pendulum clocks on site. It also covers testing and making running adjustments to ensure correct function and performance and applies to any clock repairer or vendor required to install, set up and test pendulum clocks on site, including in domestic residences and commercial buildings.

The most common application is usually a set-up and installation of new (long-case, wall or shelf) clocks or a set-up and installation after the return of serviced clocks to a customer's premises.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Handle clocks, shipment and delivery**	2.1	Verify and agree clock location requirements (environmental and architectural) with customer
		2.2	Prepare the clock for shipment/transport
		2.3	Arrange delivery, as required
		2.4	Pack parts to avoid damage in transit
		2.5	Complete clock handover with customer
3	**Assemble and install clocks**	3.1	Select and use appropriate tools and equipment
		3.2	Unpack components and verify completeness
		3.3	Install and stabilise clock case using appropriate methods and fixings
		3.4	Assemble clock and verify clock functions
4	**Determine in-beat and adjust pendulum oscillating systems**	4.1	Conduct in-beat assessment
		4.2	Identify in-beat adjustment method and perform adjustments
		4.3	Evaluate pendulum amplitude and action
5	**Verify additional**	5.1	Test and confirm correct striking and chiming sequence

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	clock functions	5.2	Adjust, as required, to ensure correct tone and harmony
		5.3	Set clock to time and confirm correct functioning of calendar and automatic night shut-off
6	**Conduct basic clock regulation techniques**	6.1	Set up and use timing equipment in a correct manner
		6.2	Verify pendulum rate
		6.3	Perform rate adjustments to achieve accurate timekeeping

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Prepare the clock includes the following:	• separating and packaging of components • partial dismantling of clock (pendulum and weights) • secure gong rods/hammers
Clock handover includes the following:	• informing customer of features and characteristics of clock • demonstrating winding and setting procedures for clock • informing customer of operation/switching of any automatic night silent/shut-off for chiming/striking mechanism • warranty information • recording date of installation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:

- hand tools
- drills
- spirit level
- power tools
- safety equipment, including personal protective equipment
- cleaning equipment

Verify completeness includes the following:

- all components checked against packing slip/component list
- case parts, pendulum, weights and key
- striking and chiming rods, bells or tubes

Appropriate methods and fixings include one (1) or more of the following:

- suitable location/position identified:
  - level
  - stable
  - drafts
  - people traffic
- wedges
- floor and wall fixings

Clock functions include one (1) or more of the following:

- pendulum in-beat
- striking and chiming
- winding and setting
- calendar-moon phase

In-beat assessment includes the following:

- clock secure and level position
- pendulum assembly complete and correctly attached
- listen for evidence of even tick

In-beat adjustment method includes one (1) or more of the following:

- friction crutch
- cam wheel
- bending crutch
- automatic beat adjuster

Rate adjustments include one (1) or more of the following:

- effect of changing pendulum length

(shortening = gain, lengthening = loss)

- methods of adjusting bob position
- French devices
- weight trays

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21016A Install and set up clocks

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21016 Install and set up clocks

Modification History

Release 1. Supersedes and is equivalent to MEM21016A Install and set up clocks

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- verifying and agreeing on clock location requirements and preparing the clock for shipment/transport
- setting up and installing pendulum clocks using appropriate methods and fixings
- using appropriate tools and equipment to set up and install clocks
- unpacking components and verifying contents against packing slip/component list in accordance with manufacturer's specifications
- testing and adjusting clock functions
- interpreting timing test results and making rate adjustments to achieve accurate timing and performance.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of clocks
- implications for correct set-up
- assessments, tests and correct operational function confirmation processes required
- set up and adjustment techniques
- wall and floor fixing methods
- tools and equipment for installation
- packaging methods and materials
- techniques to prevent transit damage
- types of power sources used in clocks
- precautions when handling clock cases
- major sections of mechanical clocks
- components and function of clocks.

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Assessment Conditions

- Assessors must:
  - have vocational competency in installing and setting up clocks at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21017 Service and repair clock timepieces

Modification History

Release 1. Supersedes and is equivalent to MEM21017A Service and repair clock timepieces

Application

This unit of competency defines the skills and knowledge required to service wall, floor or shelf clock timepieces that have a running time of eight days or thirty hours.

Where the clock is to be installed at the client's premises after service and repair unit MEM21016 Install and set up clocks should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 6

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	customer	1.3	Identify clock origin and case and movement construction and function
		1.4	Verify clock condition and performance concerns with customer
		1.5	Prepare written and verbal quotations
		1.6	Agree with customer on recommended service procedures
		1.7	Prepare clock for handover
		1.8	Record and document repair process
		1.9	Source replacement parts from industry suppliers
2	**Disassemble clock, case and movement components for servicing**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Handle components without damaging or marking
		2.4	Remove clock movements in sequence considering case design and construction
		2.5	Select and use appropriate hand and bench tools
		2.6	Verify condition and completeness of clock case
		2.7	Perform power release in a safe manner
		2.8	Dismantle clock movement in correct sequence
3	**Service and repair movement, sub-assemblies and components**	3.1	Inspect movement, sub-assemblies and components, and identify condition and faults
		3.2	Confirm servicing and repair requirements
		3.3	Replace or repair faulty or worn component parts, movement or sub-assemblies

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Use appropriate hand tools and equipment for servicing and repair
		3.5	Clean clock components at appropriate stages using cleaning and finishing methods
		3.6	Verify condition of components after cleaning
4	**Service clock cases**	4.1	Verify completeness of clock case
		4.2	Repair and replace missing or damaged components
		4.3	Clean internals and refinish/refurbish exterior with appropriate materials and techniques
5	**Reassemble clock movement and case components**	5.1	Reassemble clock movement and case components
		5.2	Assemble motion work and verify and adjust hand setting tension
		5.3	Check and adjust component operations and clock functioning
		5.4	Select and apply lubricants according to component design and estimated frictional load
		5.5	Apply clock assembly inspections and precautions
		5.6	Install and secure movement in case
6	**Bench test and adjust clock functions**	6.1	Verify function of clock movement
		6.2	Set up, operate mechanical clock timing machine and interpret readings
		6.3	Verify clock performance and rate testing
		6.4	Adjust rate according to performance and design characteristics

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Clock origin, case and movement construction and function includes one (1) or more of the following:	• clocks from all countries of manufacture • clocks manufactured during the 19th and 20th Centuries • clock cases made from timber, metal, natural stone and composite materials • movement components made from brass and steel • pendulum or balance oscillating systems • timepiece only mechanisms • motive force (mainspring or weight driven) • gear train for transmitting of power • escapement for release power • oscillator for controlling the speed of release of power • winding (by key) • time setting (by key or direct movement of hands)
Clock handover includes the following:	• informing customer of features and characteristics of clock • demonstrating winding and setting procedures for clock • inform customer of operation and switching of any automatic night silent, or shut-off for chiming or striking mechanism • warranty information • date of installation
Record and document repair process includes one (1) or more of the following:	• extent and date of repair recorded • tracking of subcontractors • cost of replacement parts • time spent on procedure

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate working environment includes the following:

- clean bench and working area
- adequate lighting and ventilation
- tools and equipment organised and in good condition
- ergonomic seating, including bench height

Condition and faults include one (1) or more of the following:

- originality of components
- corrosion
- cleanliness
- wear
- damaged or failed components

Faulty or worn components include one (1) or more of the following:

- barrel and mainspring:
  - hooking
  - teeth
  - bearings
- gear trains:
  - bearings
  - pivots
  - pinions
- pendulum escapements:
  - pallets and escape wheels engagement drop
  - locking and impulse
- oscillators pendulum type:
  - rod
  - crutch engagement
  - suspension spring fittings
  - bob security
- oscillators balance type:
  - balance spring
  - balance staff
  - roller
- winding mechanisms:
  - key fitting
  - click
  - ratchet wheel
  - click spring

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- setting hand tension or centre wheel friction

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hand tools and equipment include one (1) or more of the following:	• clock repairers' hand tools:
	  • tweezers
	  • screwdrivers
	  • eyeglasses
	• clock mainspring winder
	• clock re-bushing tool
	• reamers and smoothing broaches
	• lathe
	• oilstones and burnishers
	• movement supports for clock movements
	• oilers and oil pots
	• cleaning brushes, peg wood, solutions, rinses and solvents
	• clock timing machine (this includes any type of machine that provides frequency count or indication of daily rate)

Verify and adjust hand setting tension includes one (1) or more of the following:	• test for correct friction (power to escape wheel) • adjustment of motion work friction
Select and apply lubricants include one (1) or more of the following:	• correct lubricants for escapements, bearings, barrels and mainsprings • techniques for lubricating
Clock assembly inspections and precautions include one (1) or more of the following:	• gear train end shake, backlash, lubrication • mainspring engagement, hooking, tension, lubrication • escapement operation, depthing, lubrication • pendulum oscillator (amplitude, crutch engagement or suspension function) • balance oscillators (end shake or balance spring condition, correct lubrication)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Performance and design characteristics include one (1) or more of the following:	• source of motive force • escapement type • oscillator and pendulum construction

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21017A Service and repair clock timepieces

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21017 Service and repair clock timepieces

Modification History

Release 1. Supersedes and is equivalent to MEM21017A Service and repair clock timepieces

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying clock origin, case and movement
- liaising with customer and verifying condition and performance
- identifying repair costs and preparing written quotation
- dismantling and reassembling clock movement and components in an appropriate work environment
- identifying and rectifying wear and faults in escapement, bearings, arbors, wheels and pinions
- safely handling of clock mainsprings, including using mainspring handling equipment
- using appropriate hand tools and equipment for servicing and repairs
- safely cleaning clock components using appropriate methods and media
- selecting and applying correct lubricants for escapements, bearings, barrels and mainsprings and using appropriate lubrication techniques
- performing function and performance testing
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures and safe work practices
- identifying clock origin, case and movement
- liaising with customer and verifying condition and performance
- identifying repair costs and preparing written quotation
- dismantling and reassembling clock movement and components in an appropriate work environment
- identifying and rectifying wear and faults in escapement, bearings, arbors, wheels and pinions
- safely handling of clock mainsprings, including using mainspring handling equipment

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- using appropriate hand tools and equipment for servicing and repairs
- safely cleaning clock components using appropriate methods and media
- selecting and applying correct lubricants for escapements, bearings, barrels and mainsprings and using appropriate lubrication techniques
- performing function and performance testing
- recording and documenting repairs.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing clock timepieces at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM21018 Service clock escapements and oscillating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21018A Service clock escapements and oscillating systems

Application

This unit of competency defines the skills and knowledge required to apply service and repair techniques to inspect, diagnose faults, repair and adjust common clock escapements and oscillating systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches
MEM21012	Service and repair mechanical watch oscillating systems
MEM21013	Service, test and adjust watch escapements
MEM21017	Service and repair clock timepieces

Competency Field

Horology

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify escapement and oscillator type**	2.1	Identify clock escapements/oscillating systems and applications
		2.2	Establish the performance characteristics of the clock according to escapement and oscillating system
		2.3	Record and document repair requirements
3	**Diagnose clock escapements and oscillators**	3.1	Select and use appropriate workshop tools and equipment
		3.2	Inspect clock escapement and oscillators for correct function, engagement and performance
		3.3	Record and report wear and damage to parts
		3.4	Determine appropriate repair process to rectify faults
4	**Repair and adjust clock escapements and oscillators**	4.1	Remove and reassemble escapement/oscillators using appropriate tools, equipment and techniques
		4.2	Determine theoretical length of replacement pendulum
		4.3	Repair or replace escapement and oscillator components
		4.4	Adjust escapement and oscillator components for correct operation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
5	**Service and adjust torsional pendulums**	5.1	Remove and reassemble torsional pendulums and oscillator components using appropriate tools, equipment and techniques
		5.2	Inspect torsional pendulum components and identify condition and wear
		5.3	Repair and replace torsional pendulum
		5.4	Adjust torsional pendulum for correct operation (in-beat)
6	**Service and set up platform escapements**	6.1	Remove and reassemble platform escapement using appropriate tools, equipment and techniques
		6.2	Inspect platform escapement and identify condition/wear
		6.3	Repair and replace platform escapement
		6.4	Adjust platform escapement and correct depthing with contrate wheel
7	**Test and adjust rate**	7.1	Verify and confirm function of clock movement
		7.2	Set up and operate mechanical clock timing machine and interpret readings
		7.3	Verify clock performance and rate testing
		7.4	Adjust rate, as required, according to performance and design characteristics

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Clock escapements/ oscillator systems include one (1) or more of the following:	• verge • recoil escapement • deadbeat escapement • cylinder • platform (lever escapement or cylinder) • simple pendulum • compound pendulum • compensating pendulum • torsion pendulum • floating balance • suspension systems (spring blade, knife edge or silk)
Record and document repair includes one (1) or more of the following:	• extent and date of repair • cost of replacement part • time spent on procedure
Adjust escapement and oscillator includes one (1) or more of the following:	• condition amount of drop • condition and extent of lockings • condition and amount of impulse • pendulum action and amplitude • in-beat
Torsional pendulums include one (1) or more of the following:	• 400 day clocks • Atmos clocks • suspension spring

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21018A Service clock escapements and oscillating systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21018 Service clock escapements and oscillating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21018A Service clock escapements and oscillating systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying different types of clock escapements/oscillating systems
- liaising with customer, verifying condition and performance, and identifying repair costs
- diagnosing and repairing faults in clock escapement action and fault finding oscillating systems
- calculating length of replacement pendulum and repairing, replacing and adjusting pendulum
- repairing, replacing and adjusting escapement and oscillator components
- setting up and adjusting clock escapements for optimum performance
- adjusting platform escapement and correct depthing with contrate wheel
- verifying and confirming function of clock movement and adjusting rate of timepiece using appropriate timing machine in accordance with procedures
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- clock escapement types
- oscillator types
- torsional pendulums and oscillator components
- performance characteristics of escapements and oscillators
- escapement adjusting techniques
- clock servicing procedures and techniques
- calculations and formulas for length of pendulum and geometry of escapements.

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Assessment Conditions

- Assessors must:
  - have vocational competency in servicing clock escapements and oscillating systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM21019 Service and repair clock striking mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21019A Service and repair clock striking mechanisms

Application

This unit of competency defines the skills and knowledge required to service and repair mechanical floor, wall and shelf clocks fitted with rack or count wheel striking mechanisms.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21017	Service and repair clock timepieces

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
	customer	1.3 Identify function and type of striking mechanism
		1.4 Verify clock condition and performance concerns with customer
		1.5 Prepare written and verbal quotations
		1.6 Agree with customer on recommended service procedures
		1.7 Prepare clock for handover
		1.8 Record and document repair process
		1.9 Source replacement parts from industry suppliers
2	**Service and repair strike mechanisms**	2.1 Establish an appropriate clean and safe work environment
		2.2 Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3 Remove and replace movement from case, considering case design and strike mechanism employed
		2.4 Handle components without damaging and marking
		2.5 Use appropriate hand, bench tools and equipment in a safe and correct manner
		2.6 Confirm operation of strike mechanism
		2.7 Dismantle and reassemble strike components in correct sequence
		2.8 Verify orientation of gear trains and strike detents
		2.9 Inspect strike release, activation and sound generation and identify wear, condition and faults
		2.10 Confirm servicing and repair requirements
		2.11 Repair and rectify faults in strike components
		2.12 Clean and reassemble mechanism and verify correct

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	set-up, operation and performance
	2.13 Select and apply lubricants to strike components
3 **Bench test and adjust striking mechanism**	3.1 Verify correct operation and function of striking mechanism
	3.2 Verify clock operation over 24-hour period
	3.3 Determine and rectify striking faults

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Function and type of striking mechanism includes one (1) or more of the following:	• motive force (mainspring or weight driven) • gear train (transmits power) • ways of producing striking sound (metal gongs, chime rods, bells or air bellows) • count wheel striking movements (European or American manufacture) • rack striking movements (European or American manufacture)
Record and document repair process includes one (1) or more of the following:	• date and extent of repair • cost of replacement parts • time spent on procedure

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Operation of strike mechanism includes one (1) or more of the following:	• hour struck corresponds with hands • release mechanism synchronised with hands • warning set-up correctly • function of release mechanism • sound generation (gongs, rods or hammer engagement)
Striking mechanism components include one (1) or more of the following:	• release mechanism • gathering pallet • detents • counting mechanism (snail or count wheel) • rack • gongs, chime rods and bells • hammers
Faults in striking mechanism components include one (1) or more of the following:	• incorrect striking • continuous striking • striking mechanism stops clock or impacts on timekeeping • warning set-up • gong security • pin security • gathering pallet engagement with rack teeth, tightness and positioning • rack tail engagement position with snail • hammer inserts (condition - worn or aged) • security of gongs, rods and attachment to case
Correct set-up includes one (1) or more of the following:	• synchronised strike release with hands • amount of warning • correct sequence • sound of strike
Lubricants to striking mechanism components include the following:	• correct lubricants for cams and detents • techniques for lubricating

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hand and bench tools and equipment includes one (1) or more of the following:	• clock repairers' hand tools:
	  • tweezers
	  • screwdrivers
	  • eyeglasses
	• universal shifter, sockets and spanners
	• pliers, end cutters and files
	• stakes for supporting removal or replacement of gathering pallet and cannon pinions
	• oilers and oil pots and greases
	• cleaning brushes, peg wood, solutions, rinses and solvents

Appropriate working environment includes the following:	• clean bench and working area • adequate lighting and ventilation • tools and equipment organised and in good condition • ergonomic seating, including bench height

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21019A Service and repair clock striking mechanisms

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21019 Service and repair clock striking mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21019A Service and repair clock striking mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying function and type of striking mechanism
- liaising with customer, verifying condition and performance, and identifying repair costs
- dismantling and reassembling clocks with count wheel striking mechanisms in an appropriate work environment
- dismantling and reassembling clocks with rack striking mechanisms in accordance with manufacturer's specifications and procedures
- using appropriate hand and bench tools and equipment for servicing and repairing
- adjusting striking clock mechanisms for correct operation and synchronisation with hands and sound generation and tonality and verifying correct set-up
- selecting and applying correct lubricants for cams and detents and using appropriate lubrication techniques
- performing operation and performance testing of striking clocks
- diagnosing faults relating to strike mechanisms
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of clock striking systems
- difference between designs from various manufacturers
- application of gong rods, bells and hammers to achieve correct resonant sound generation
- strike fault-finding techniques
- fault-finding techniques for ensuring strike does not impact on clock operation
- service and repair techniques for striking mechanisms
- dismantling and reassembling techniques for striking mechanisms.

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Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing clock striking mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM21020 Service and repair clock chiming mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21020A Service and repair clock chiming mechanisms

Application

This unit of competency defines the skills and knowledge required to service and repair mechanical floor, wall and shelf clocks that are fitted with chiming mechanisms.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 6

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM21017	Service and repair clock timepieces
MEM21019	Service and repair clock striking mechanisms

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine servicing requirements and**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	liaise with customer		requirements at all times
		1.3	Identify functions and types of chiming system
		1.4	Verify clock condition and performance concerns with customer
		1.5	Prepare written and verbal quotations
		1.6	Agree with customer on recommended service procedures
		1.7	Prepare clock for handover
		1.8	Record and document repair process
		1.9	Source replacement parts from industry suppliers
2	**Service and repair chiming mechanisms**	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Remove and replace movement considering case design and chiming system employed
		2.4	Handle components without damaging and marking
		2.5	Use appropriate hand, bench tools and equipment in a safe and correct manner
		2.6	Confirm design and operation of the chime corrector mechanism
		2.7	Determine service procedure for particular movement design
		2.8	Inspect condition of chime release, activation and sound generation, and identify wear and faults
		2.9	Dismantle and clean chiming components
		2.10	Verify orientation of gear trains, strike and chime detents

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.11	Confirm servicing and repair requirements
		2.12	Repair and rectify faults in chiming components
		2.13	Reassemble chiming mechanism and verify correct set-up, operation and performance
		2.14	Select and apply lubricants to chime components
3	**Bench test and adjust chime functions**	3.1	Verify and confirm function of chiming mechanism
		3.2	Verify clock operation over 24 hour period
		3.3	Determine and rectify faults in chiming mechanism

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Functions and types of chiming system include one (1) or more of the following:	• chiming clocks of various movement design (count wheel or locking plate, rack or combinations of control systems) • long case and mantle clocks • motive force (mainsprings or weights) • gear trains (components of each train) • chime release mechanism (control functions - chime and strike) • chime and strike fans (control speed of trains) • hand setting and synchronisation with chimes and strike • winding systems in chiming clocks • night shut-off switch types • chime correcting mechanisms • types of chimes by hammers and sequences for tunes (4 or 8 hammer) • tunes played (Westminster, St. Michaels or Whittington) • chiming media (gongs, tubes or bells)
Record and document repair process includes one (1) or more of the following:	• date and extent of repair • cost of replacement parts • time spent on procedure
Design and operation of chiming corrector mechanism includes one (1) or more of the following:	• double detent • spring loaded catch • rocking locking plate • bell crank • pivoted detent

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Inspect condition includes one (1) or more of the following:

- originality of components
- corrosion
- cleanliness
- wear
- hand setting tension
- function and safety of winding mechanism
- gear train end shake/backlash/lubrication
- mainspring engagement/hooking/tension/ lubrication
- adjustment of chime and striking functions
- verification of chime corrector functions
- synchronised chime release with operations of hands at the four quarters
- amount of warning for chime train
- strike release mechanism operation
- sound of chimes and strike monitored
- gong rods, bells, tubes alignment and security including attachment to case
- hammer head inserts (condition - worn or aged)

Chime components include one (1) or more of the following:

- four quarter cam
- lifter
- chime flirt or detents
- strike flirt or detent
- chime locking plate
- chime corrector
- chime gear train
- ratio wheel
- chime pin barrel
- gong rods, bells and tubes
- hammers

Faults in chime components include one (1) or more of the following:

- mounting security (gong rods, bells or tubes)
- warning and locking pin security and detent mountings
- hammer condition
- worn arbors and bearings
- broken or worn chime components

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Correct set-up includes the following:

- synchronised chime release with hands
- amount of warning
- chime corrector operation
- correct tune sequence
- sounds of chime

Hand tools and equipment include one (1) or more of the following:

- clock repairers' hand tools:
  - tweezers
  - screwdrivers
  - eyeglasses
- universal shifter, sockets and spanners
- pliers, end cutters, files and levers
- movement holders, stands and wall brackets
- stakes for supporting removal/replacement of components
- lathe for pivot and arbor repairs and finishing
- clock bushing tool and replacement bushes
- lubrication (oiler, oil pots and greases)
- cleaning brushes, peg wood, solutions, rinses and solvents

Appropriate working environment includes the following:

- clean bench and working area
- adequate lighting and ventilation
- tools and equipment organised and in good condition
- ergonomic seating, including bench height

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21020A Service and repair clock chiming mechanisms

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21020 Service and repair clock chiming mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21020A Service and repair clock chiming mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying country of origin with respect to count wheel or locking plate chiming mechanism
- liaising with customer, verifying condition and performance, identifying repair costs and preparing written and verbal quotations
- dismantling and reassembling clocks with chiming mechanisms in an appropriate work environment
- fault finding clocks with chiming mechanisms
- repairing/replacing worn or damaged components using appropriate hand tools and equipment
- performing correct set-up of chiming mechanisms
- adjusting clock chiming mechanisms for correct operation/synchronisation with hands and sound generation/tonality
- applying lubrication techniques (correct type and amount)
- diagnosing and rectifying faults relating to chime mechanisms and verifying operation of chime correctors
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of clock chiming systems and chime correcting mechanisms
- differences between designs from various manufacturers
- application of gong rod, bells and hammers to achieve correct resonant sound generation
- dismantling and reassembling techniques for chiming mechanisms
- correct amount of warning and chime corrector operation

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- clock chiming mechanism fault-finding techniques
- fault-finding techniques for ensuring chime does not impact on clock operation
- service and repair techniques for chiming mechanisms.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing and repairing clock chiming mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21021 Restore clockwork mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21021A Restore clockwork mechanisms

Application

This unit of competency defines the skills and knowledge required to restore and repair clock components by manufacturing parts using hand skills and machine tools and also covers servicing power equalisation systems.

Application includes restoration and repair work to antique clocks where parts are no longer available.

Where machine manufacture of clock components is required unit MEM21022 Manufacture watch and clock components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit weight: 6

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21017	Service and repair clock timepieces
MEM21019	Service and repair clock striking mechanisms

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MEM21020 Service and repair clock chiming mechanisms

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify clock restoration requirements**	2.1	Identify missing, damaged or worn parts
		2.2	Identify prior modifications and repairs, including non-standard or non-original components
		2.3	Plan repairs in consideration of original clock design and manufacture
		2.4	Record and document repair
3	**Service and repair power equalisation devices**	3.1	Identify fusee and stopwork device
		3.2	Release mainspring power
		3.3	Diagnose system faults
		3.4	Replace fusee chains or cables
		3.5	Set up fusee and stopwork systems

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Produce clock parts by hand**	4.1	Prepare working drawings and templates of replacement parts
		4.2	Plan suitable method and sequence of production
		4.3	Select materials suitable for manufacturing
		4.4	Transfer designs and mark out templates and work pieces
		4.5	Select appropriate hand tools to undertake process
		4.6	Produce components by hand to required specifications
		4.7	Conduct finishing, heat treatment and polishing of components
		4.8	Verify function of manufactured components
5	**Refinish and polish clock components**	5.1	Select appropriate refinishing process to repair worn or corroded clock components
		5.2	Refinish parts to replicate original finish
		5.3	Adjust refinished components for correct function
6	**Repair gears, wheels and arbors**	6.1	Identify worn or damaged teeth
		6.2	Fit, file and shape replacement teeth
		6.3	Re-pivot arbors
		6.4	Secure replacement part using appropriate fixing method
		6.5	Test-run with matched component

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Clock design and manufacture includes one (1) or more of the following:	• remaining faithful to original design and finish • accounting for value and provenance • maintaining originality of parts
Record and document repair includes one (1) or more of the following:	• date and extent of repair • cost of replacement part • time spent on procedure
Working drawings and templates include one (1) or more of the following:	• sketch or illustration by hand • photocopy original component then adhere to stock
Appropriate tools and equipment include one (1) or more of the following:	• files • burnishers • oil stones • jewellers saw • finishing papers • needle files • marking out equipment • lathe/drilling tailstock
Produce components by hand includes the use of one (1) or more of the following:	• pallets • striking and chiming levers • ratchet wheels • clickwork • taper pins
Heat treatment includes one (1) or more of the following:	• annealing • hardening • tempering (bluing)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Refinishing process includes one (1) or more of the following:	• filing • honing • graining • polishing
Clock components include one (1) or more of the following:	• arbors and pinions • clicks • pallets • screws • taper pins
Fixing method includes one (1) or more of the following:	• Loctite • low melting solder • electronic soldering iron • spirit lamp

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21021A Restore clockwork mechanisms

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21021 Restore clockwork mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21021A Restore clockwork mechanisms

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying missing damaged or worn parts
- liaising with customer, identifying restoration costs and planning and conducting repairs to maintain originality of timepiece
- servicing and repairing power equalisation devices, including dismantling, assembling and setting up fusee systems
- using appropriate tools and equipment for restoration work
- preparing and using working drawings and templates to manufacture components by hand
- applying appropriate heat treatment process and refinish manufacture process to achieve desired result and verifying correct function of manufactured components
- repairing gears, wheels and arbors and test run with matched component
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- clock design and manufacture
- design and drawing of replacement parts
- techniques for manufacturing replacement parts
- gear forms (cycloidal and involute)
- gear terminology (pitch and root diameter)
- types and uses of files, including shapes and cuts
- jeweller saws and blades
- metal types and applications to clock components
- power equalisation devices and their function
- finishing and polishing techniques and media.

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Assessment Conditions

- Assessors must:
  - have vocational competency in restoring clockwork mechanisms at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21022 Manufacture watch and clock components

Modification History

Release 1. Supersedes and is equivalent to MEM21022A Manufacture watch and clock components

Application

This unit of competency defines the skills and knowledge required to manufacture replacement watch and clock components using general and specialist machines and engineering techniques as required. It applies when replacement parts are not available and there is a need to manufacture a suitable replacement.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit weight: 6

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM07005	Perform general machining
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21017	Service and repair clock timepieces

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MEM21019	Service and repair clock striking mechanisms
MEM21020	Service and repair clock chiming mechanisms
MEM21021	Restore clockwork mechanisms

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine servicing requirements and liaise with customer**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify the need for a replacement component
		1.4	Establish that replacement parts are not available and advise customer of the need to manufacture in-house
		1.5	Prepare written and verbal quotations
		1.6	Agree with customer on recommended procedures to remedy faults, including servicing requirements
		1.7	Prepare watch or clock for handover
		1.8	Record and document repair process
		1.9	Source material for manufacture of parts
2	**Plan and organise the project**	2.1	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.2	Prepare working drawings of replacement parts
		2.3	Plan suitable method of production
		2.4	Select materials suitable for manufacture

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.5	Perform marking out of components
		2.6	Select appropriate equipment and tools to undertake process
3	**Produce components using a watch and clockmaker's lathe**	3.1	Set up and mount the material to be turned in appropriate chuck
		3.2	Select and prepare the appropriate cutting tool for the turning operation
		3.3	Perform turning or drilling operation to produce replacement parts
		3.4	Undertake measurements to task tolerances
4	**Produce components using milling attachments on a clockmaker's lathe or bench-mounted mill**	4.1	Set up and mount the material to be milled in appropriate fixture or chuck
		4.2	Select and prepare the appropriate tool or cutter for milling operation
		4.3	Perform milling operation to produce replacement parts
		4.4	Undertake measurements to task tolerances
5	**Produce wheels and pinions**	5.1	Select the index head and appropriate index plate to produce the required tooth count, as appropriate
		5.2	Set up gear blank in dividing head
		5.3	Select appropriate gear cutter and mount in milling spindle ensuring cutter is on centre
		5.4	Machine teeth to correct depth
6	**Finish manufactured**	6.1	Cross out wheel to match original component
		6.2	Remove any burrs and finish with appropriate media

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
components	6.3 Carry out heat treatment to suit function of replacement part
	6.4 Verify function of manufactured component

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Record and document repair includes one (1) or more of the following:	• date and extent of repair • cost of replacement part • time spent on procedure
Working drawings include one (1) or more of the following:	• sketch • illustration by hand, including dimensions
Appropriate chuck includes one (1) or more of the following:	• collet • three jaw • four jaw
Appropriate cutting tool includes one (1) or more of the following:	• graver • cutting tool angle • parting off tool

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21022A Manufacture watch and clock components

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21022 Manufacture watch and clock components

Modification History

Release 1. Supersedes and is equivalent to MEM21022A Manufacture watch and clock components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying the need for replacement component parts, liaising with customer and determining costs
- interpreting watch and clock working drawings, manuals and other documentation that provide information on part design and tolerances
- setting up and mounting the material to be turned using appropriate chuck and manufacturing, finishing and fitting replacement watch or clock components to original tolerances using a watch and clockmaker’s lathe
- performing milling operations using indexing and milling attachments on the lathe or bench-mounted milling machine to dimension and tolerances
- selecting and preparing appropriate tool or cutter to produce replacement parts
- producing replacement parts, including wheels and pinions with their teeth machined to the correct depth
- finishing manufactured components and recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- typical materials used in watch and clockmaking
- types of watch and clockmakers' lathes and attachments
- lathe accessories and tooling
- set up and safe operation of watch and clockmakers' lathes and attachments
- documentation requirements
- set up and safe operation of milling machines and attachments
- calculate speeds, feeds and indexing requirements
- surface finish requirements for clock and watch parts

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- heat treatment requirements for replacement parts
- milling procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in manufacturing watch and clock components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM21023 Plan, set up and operate horological workshop or service centre

Modification History

Release 1. Supersedes and is equivalent to MEM21023A Plan, set up and operate horological workshop or service centre

Application

This unit of competency defines the skills and knowledge required to plan, equip and set up a functional horological workshop or service centre.

It has been developed for post-trade training and the recognition of advanced trade-level skills in planning, equipping and setting up a functional horological workshop or service centre.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Plan workshop**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	layout	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Prepare sketches of workshop layout
		1.4	Plan work zones
		1.5	Source suppliers of fixtures and furnishings
2	**Source and purchase tools and equipment**	2.1	Establish a budget
		2.2	Determine major plant equipment for after sales service
		2.3	Establish an adequate supply of tools for each workbench
		2.4	Source suppliers of tools and equipment
		2.5	Establish costs and initiate purchase
3	**Set up workshop or service centre**	3.1	Purchase and set up furnishings and fittings
		3.2	Install major plant bench tools and machinery
		3.3	Implement ventilation, extraction and climate control systems
		3.4	Establish repair administration systems
		3.5	Establish spare parts systems and controls
		3.6	Implement control and security measures for repair process
4	**Prepare quotations and orders**	4.1	Calculate profitability
		4.2	Establish hourly rate
		4.3	Establish service and repair requirements
		4.4	Determine availability and cost of spare parts
		4.5	Provide customer with estimate
		4.6	Prepare spare parts and other orders

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
5 **Monitor workshop operations**	5.1 Establish maintenance procedures for premises, major plant, equipment and tools
	5.2 Review systems for efficiency and effectiveness
	5.3 Implement improvements to operations

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Workshop layout includes the following:	• orientation for adequate natural/artificial light • ventilation control • humidity and dust • appropriately positioned power points • consideration of work zone layout
Work zones include the following:	• customer reception • administration • dismantling and reassembling • cleaning • polishing • storage (solvents, spare parts or technical guides)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fixtures and furnishings include the following:	• workbenches • chairs • lights • ventilation, extraction and dust suppression • climate control • desks • point of sale and cash control devices
Major plant and equipment includes the following:	• watch and clock servicing equipment • testing equipment • electronic testers for control of timing and water-resistance testing • machinery • lathe • bench equipment • drill press • staking set
Supply of tools include the following:	• comprehensive assortment of watch and clockmakers' hand tools • reference catalogues and publications
Ventilation, extraction and climate control systems include the following:	• air conditioning and ventilation • dust extraction and trapping • chemical storage • decanting areas • fume cupboards
Repair administration systems include the following:	• job envelope system • repair tracking software • quotations • security of goods held in trust • spare parts and repair administration procedures
Other orders include the following:	• supplies • tools and equipment • consumables • materials and solutions

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21023A Plan, set up and operate horological workshop or service centre

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM21023 Plan, set up and operate horological workshop or service centre

Modification History

Release 1. Supersedes and is equivalent to MEM21023A Plan, set up and operate horological workshop or service centre

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- planning horological service centre layout
- planning the work zones
- sourcing suppliers for fixtures and furnishings
- sourcing and setting up major plant and equipment and establishing an adequate supply of tools
- implementing ventilation, extraction and climate control systems
- setting up repair systems and administration procedures
- preparing quotes, estimates and orders
- monitoring and reviewing operations, procedures and systems.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- horological workshop and service centre layouts, zoning of areas and other considerations
- work health and safety (WHS) issues for watch and clock trade
- handling and storage/disposal of solvents and other chemicals
- administration procedures and systems
- job control systems and methods of monitoring work flow
- horological tools and equipment/suppliers
- ergonomics, ventilation, dust control, lighting and climate control requirements for horological industry.

Assessment Conditions

- Assessors must:

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  - have vocational competency in planning, setting up and operating horological workshop or service centre at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM24001B Perform basic penetrant testing

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers performing basic penetrant testing procedures in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to basic penetrant testing techniques on fabrications, structures and components across a wide range of industries and restricted to basic visible dye and/or process penetrant line methods. The work can relate to scheduled and unscheduled maintenance activities, using general tools, specific penetrant testing equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components and structures. Penetrant testing is performed on critical component or structural zones. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - must be subject to safe work habits and must be stored and used in accordance with safe work practices. This unit should not be selected when Unit MEM24002B

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	(Perform penetrant testing) has already been selected. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for basic penetrant testing	1.1. Inspection areas are cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform basic penetrant testing	2.1. Nominated test is identified from standard operating procedures. 2.2. Test equipment is prepared in accordance with standard operating procedures. 2.3. Test media is selected and applied in accordance with workplace practices and specifications. 2.4. Penetrant test is carried out in accordance with relevant work instructions and OH&S requirements. 2.5. Penetrant testing equipment is maintained and stored in accordance with standard operating procedures and OH&S requirements.
3. Report the results of penetrant test(s)	3.1. Basic indications are checked and defects are identified in accordance with enterprise standards and/or procedures. 3.2. Basic indications are confirmed in accordance with enterprise standards and/or procedures. 3.3. Test results are reported in accordance with enterprise standards and/or procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • preparing inspection areas • identifying discontinuities • applying procedures

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REQUIRED SKILLS AND KNOWLEDGE

- applying test media
- applying principles of penetrant testing techniques
- identifying defects
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures.
- following oral instructions
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes
- precleaning methods and their areas of use - solvents, vapour degrease, etching, detergents, paint removers, mechanical methods
- consequences of incorrect preparation
- procedures and OH&S requirements in relation to the preparation process
- basic concepts and principles of NDT; general terms, purpose of NDT and areas of application of NDT
- scope and basic description of test
- general properties of penetrants - penetrability, removability, visibility
- emulsifier types
- developer types
- use of standard test panels
- established inspection procedures and techniques
- types of discontinuities and their consequences
- procedure for carrying out penetrant testing
- penetrant application
- dwell times
- penetrant removal
- developer application
- dry powder
- development time
- factors affecting indications
- non-relevant indications
- post-cleaning methods and their areas of use
- basic maintenance and storage procedures for testing equipment
- OH&S requirements including storage requirements
- definition of a defect and common basic defects
- methods/procedures for reporting test results

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform basic penetrant testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing basic penetrant testing or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures,

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EVIDENCE GUIDE	
	product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying
Obvious discontinuities	Observed changes in material homogeneity
Reported	Accurate identification of location and size of discontinuities

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Non-destructive testing

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MEM24002B Perform penetrant testing

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers performing penetrant testing in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to penetrant testing techniques on fabrications, structures and components across a wide range of industries to Level 2 (AS 3669 and AS 3998) or equivalent by portable penetrant testing, processing on a dedicated penetrant line, visible dye and fluorescent methods. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific penetrant testing equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components, structures and/or aircraft components. Penetrant tests are performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian Standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices.

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	Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range

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	statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for penetrant testing	1.1. Inspection areas are identified, cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures, statutory and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform penetrant testing	2.1. The most appropriate penetrant test for the material/application is selected. 2.2. Test equipment is selected and prepared in accordance with standards and/or procedures. 2.3. Appropriate test media is selected and applied in accordance with workplace/industry practices. 2.4. Penetrant test is carried out in accordance with relevant standards, specifications and OH&S requirements. 2.5. Penetrant test equipment is checked for defects, maintained and stored in accordance with procedures, OH&S requirements and manufacturer instructions.
3. Interpret and report the results of penetrant test(s)	3.1. Indications are assessed and defects are detected and classified in accordance with national and international codes and standards. 3.2. Defects are confirmed in accordance with enterprise procedures and industry practices. 3.3. Test results are reported in accordance with enterprise procedures, accepted industry practices and customer service requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- conducting visual inspections
- identifying discontinuities and defects
- selecting appropriate testing techniques and procedures
- using decision making skills
- assessing risk
- performing measurements needed to meet the requirements of this unit
- entering routine and familiar information onto proformas and standard workplace forms
- locating, reading and interpreting information on written job instructions, specifications, drawings, charts, lists and other reference documentation
- planning, sequencing operations

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes for a range of test surfaces
- procedure, statutory and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- types of discontinuities and their consequences/effect on the material
- penetrant testing techniques and procedures for a range of situations
- tools, equipment, techniques
- principles and applications of penetrant testing techniques
- hazards and safety requirements associated with penetrant testing
- maintenance and storage procedures for test equipment
- common faults and damage
- range of defects
- meaning and application of national and international codes and standards
- methods/procedures for reporting test results
- implications of test results for the particular material/application
- any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards
- use and application of personal protective equipment
- safe work practices and procedures
- relevant hazards and control measures related to the competency

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform penetrant testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing penetrant testing in a range of industrial applications or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any

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EVIDENCE GUIDE	
	relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying
Obvious discontinuities	Observed changes in material homogeneity
Reported	Accurate identification of location and size of discontinuities

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24003B Perform basic magnetic particle testing

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers performing basic magnetic particle testing procedures in a range of industrial applications. It covers the principles of magnetism and the associated application of basic magnetic particle testing techniques in the field of non-destructive testing. Knowledge of metallurgy associated with the level of application in this unit is required.

Application of the Unit

Application of the unit	This unit applies to portable and fixed ('yoke' or 'bench') basic magnetic particle testing techniques on fabrications, structures and components across a wide range of industries. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific magnetic testing equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are considered, together with ongoing abnormalities in fabrications, components and structures. Magnetic particle testing is performed on critical component or structural zones. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - must be subject to safe work habits and must be stored and used in accordance with safe work practices.

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	This unit should not be selected when Unit MEM24004B (Perform magnetic particle testing) has already been selected. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range

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	statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for basic magnetic particle testing	1.1. Inspection areas are cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant specifications and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform basic magnetic particle testing	2.1. Nominated 'yoke' or 'bench' magnetic particle testing procedure is identified from standard operating procedures. 2.2. Test equipment is prepared in accordance with relevant standards and/or procedures. 2.3. Magnetic particle test is carried out in accordance with relevant work instructions and OHS requirements. 2.4. Magnetic particle testing equipment is maintained and stored in accordance with standard operating procedures and OH&S requirements.
3. Report the results of magnetic particle test(s)	3.1. Basic indications are checked and defects are identified in accordance with enterprise standards and/or procedures. 3.2. Basic indications are confirmed in accordance with enterprise standards and/or procedures. 3.3. Test results are reported in accordance with enterprise standards and/or procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques and procedures
- assessing risks
- entering routine and familiar information onto proformas and standard workplace forms
- locating, reading and interpreting information on written job instructions, specifications, charts, lists and other reference documentation
- planning, sequencing operations

Required knowledge

Look for evidence that confirms knowledge of:

- surface preparation
- procedures and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- types of discontinuities and their consequences
- scope and basic principles of magnetic particle testing
- procedure for carrying out magnetic particle test using either the 'yoke' or 'bench'
- advantages and limitations of magnetic particle testing
- hazards and safety precautions associated with magnetic particle testing
- basic maintenance and storage procedures for testing equipment
- common basic defects
- methods/procedures for reporting test results
- advantages, limitations of various equipment
- magnetic particle application - methods for wet, dry particles
- recording and reporting results of simple tests
- safety precautions in testing
- use of toxic, flammable materials, electrical hazards
- use and application of personal protective equipment
- safe work practices and procedures
- relevant hazards and control measures related to the competency

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform basic magnetic particle testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing basic magnetic particle testing procedures in a range of industrial applications or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24004B Perform magnetic particle testing

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers performing magnetic particle testing in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to magnetic particle testing techniques on fabrications, structures and components across a wide range of industries to Level 2 (AS 3669 and AS 3998) or equivalent. The work can relate to scheduled and unscheduled maintenance activities using general tools specific testing equipment as specified in maintenance documentation, testing procedures or operators instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components, structures and/or aircraft components. Magnetic particle testing is performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal and OH&S regulations. Certification against Australian Standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected.

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	Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for magnetic particle testing	1.1. Inspection areas are identified, cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures, statutory and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform magnetic particle testing	2.1. The most appropriate magnetic particle test for the material/application is selected. 2.2. Testing equipment is selected and prepared in accordance with standards and/or procedures. 2.3. Magnetic particle test is carried out in accordance with relevant standards, specifications and OH&S requirements. 2.4. Magnetic particle testing equipment is checked for defects, and maintained and stored in accordance with procedures, OH&S requirements and manufacturer instructions.
3. Interpret and report the results of magnetic particle tests	3.1. Indications are assessed and defects are detected and classified in accordance with national and international codes and standards. 3.2. Defects are confirmed in accordance with enterprise procedures and industry practices. 3.3. Test results are reported in accordance with enterprise procedures, accepted industry practices and customer service requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques, equipment and procedures
- reading, interpreting and applying relative testing standards
- reading, interpreting and applying relative conformance standards
- assessing risk
- undertaking calculations using formulae
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes
- procedures and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- types of discontinuities and their consequences
- magnetic particle testing techniques and procedures for a range of situations
- system verification checks necessary to carry out the magnetic particle test
- principles and applications of magnetic particle testing
- advantages and limitations of magnetic particle testing
- hazards and safety precautions associated with magnetic particle testing
- basic maintenance and storage procedures for testing equipment
- types of magnetism;
- magnetic properties
- magnetic materials
- magnetic circuits
- relative permeability of common engineering materials
- magnetic discontinuity, leakage fields
- types of equipment - portable, stationary, automated etc.
- equipment features
- nature and properties of the various types of magnetising current
- current requirements for testing
- media types - advantages and limitations of dry powders and fluid suspensions
- quality control of media, viewing conditions
- disposal procedures
- environment care
- preparation of parts

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REQUIRED SKILLS AND KNOWLEDGE
• effect of surface coatings on sensitivity • effect of surface roughness • dressing of welds • interpretation of indications • lighting conditions • use of magnification • factors influencing appearance • spurious indications, false indications • surface and sub-surface indications • common basic defects • methods/procedures for reporting test results • any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards • use and application of personal protective equipment • safe work practices and procedures • relevant hazards and control measures related to the competency

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform magnetic particle testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must

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EVIDENCE GUIDE	
	be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing magnetic particle testing in a range of industrial applications or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying

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Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24005B Perform basic eddy current testing

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers operating eddy current testing equipment and performing basic testing procedures in a specific range of industrial applications. Knowledge of metallurgy, electricity, magnetism and electromagnetism associated with the level of application in this unit is required.

Application of the Unit

Application of the unit	This unit applies to the preparation and performance of eddy current testing on fabrications, structures and components across a wide range of industries. It includes wheel bead seat, production line, tube production line and conductivity measurement methods. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific eddy current testing equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components and structures. Eddy current testing is performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with relevant standards. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices.

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	This unit should not be selected when Unit MEM24006B (Perform eddy current testing) has already been selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent

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	with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for basic eddy current testing	1.1. Inspection areas are cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform basic eddy current testing	2.1. Nominated test is identified from standard operating procedures. 2.2. Test equipment is prepared in accordance with standards and/or procedures. 2.3. Eddy current test procedure is carried out in accordance with relevant work instructions and OH&S requirements. 2.4. Eddy current test equipment is maintained and stored in accordance with standard operating procedures and OH&S requirements.
3. Report the results of basic eddy current test(s)	3.1. Basic indications are checked and defects are identified in accordance with enterprise standards and/or procedures. 3.2. Basic indications are confirmed in accordance with enterprise standards and/or procedures. 3.3. Test results are reported in accordance with enterprise standards and/or procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques, equipment and procedures
- documenting and reporting
- assessing risk
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- performing calculations using formulae

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes
- procedures and OH&S requirements in relation to the preparation process
- visual inspection
- eddy current instrument set-up
- probe selection
- established assessment procedures and techniques
- types of discontinuities and their consequences
- procedure for carrying out basic eddy current testing
- system verification checks necessary to carry out basic eddy current testing
- testing and compliance standards (enterprise specific)
- standard recording and reporting formats
- standard defects and comparative techniques
- basic principles of electricity, magnetism, electromagnetism and eddy current testing
- basic electrical principles
- test principles
- overview of factors affecting eddy current response
- basic metallurgy
- limitations of eddy current testing
- hazards and safety precautions associated with eddy current testing
- basic maintenance and storage procedures for testing equipment
- common basic defects (these are industry-specific and relevant workplace defects should be chosen)
- methods/procedures for reporting test results
- use and application of personal protective equipment

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform basic eddy current testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with operating eddy current testing equipment and applying basic testing procedures in a specific range of industrial applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be

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EVIDENCE GUIDE	
	permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Non-destructive testing

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MEM24006B Perform eddy current testing

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers performing eddy current testing in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to inspection, interpretation, classification and reporting of results of eddy current testing on fabrications, structures and components across a wide range of industries to Level 2 (AS 3669 and AS 3998) or equivalent. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific testing eddy current testing tools and equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are considered, together with ongoing abnormalities in fabrications, components, structures and/or aircraft components. Eddy current tests are performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected.

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	Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **6**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for eddy current testing	1.1. Inspection areas are identified, cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures, statutory and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform eddy current testing	2.1. The most appropriate eddy current test for the material/application is selected. 2.2. Test equipment is selected and prepared in accordance with standards and/or procedures. 2.3. Eddy current test is carried out in accordance with relevant standards, specifications and OH&S requirements. 2.4. Eddy current test equipment is checked for defects, and maintained and stored in accordance with procedures, OH&S requirements and manufacturer instructions.
3. Interpret and report the results of eddy current tests	3.1. Indications are assessed and defects are detected and classified in accordance with national and international codes and standards. 3.2. Defects are confirmed in accordance with enterprise procedures and industry practices. 3.3. Test results are reported in accordance with enterprise procedures, accepted industry practices and customer service requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques and procedures
- reading, interpreting and applying relative testing standards
- reading, interpreting and applying relative conformance standards
- using calculations relating to eddy current testing
- assessing risk
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes
- procedures and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- types of discontinuities and their consequences
- procedure for carrying out eddy current testing
- tools, equipment, techniques and system verification checks necessary to carry out eddy current testing
- basic principles of electricity, magnetism, electromagnetism and eddy current testing:
  - Reactance - field made by eddy current
  - Biot and Savant law - Definition, Practical (right hand) rules
  - Amperes law - Definition, Applications (toroid, infinite coil, flat coil)
  - Lenz law - Definition, Auto-induction factor, Mutual induction factor, Coupling factor
- induced currents - short circuit coil, metallic mass, skin effect, reactance
- cylindrical bars
- theory of eddy currents
- tubes
- geometric defect characterisation
- multiple defects
- characteristics of eddy current probes
- eddy current equipment:
  - transmission
  - reception
  - data presentation

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REQUIRED SKILLS AND KNOWLEDGE
• equipment controls • types of equipment: • physical properties of materials • electrical conductivity • magnetic permeability • applications of eddy curry testing • influence of various parameters on eddy current measurement • defect position and orientation • compensation • structure and geometry of test part • coupling influence • relative speed • limitations of eddy current testing • hazards and safety precautions associated with eddy current testing • basic maintenance and storage procedures for testing equipment • common basic defects • methods/procedures for reporting test results • any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards • use and application of personal protective equipment • safe work practices and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform eddy current testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency

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EVIDENCE GUIDE	
	in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing eddy current testing in a range of industrial applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

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RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying
Obvious discontinuities	Observed changes in material homogeneity
Defects	Corrosion, metal fatigue, deformation in non-ferrous/ferrous alloys steels, fatigue cracks, stress corrosion cracking, heat damage, metal properties sorting, manufacturing defects, coating thickness measurement etc.

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24007B Perform ultrasonic thickness testing

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers performing ultrasonic thickness testing in a range of industrial applications. Knowledge of metallurgy associated with the level of application in this unit is required.

Application of the Unit

Application of the unit	This unit applies to inspecting, interpreting and reporting on ultrasonic testing techniques of fabrications, structures and components. Testing is across a wide range of industries and includes identifying abnormalities such as thickness measurement of corrosion, laminations of non-ferrous/ferrous alloys steels, composite materials. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific ultrasonic testing equipment as specified in maintenance documentation, testing procedures or operators instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components and structures on a wide range of applications. Ultrasonic tests are performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products -

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	are subject to safe work habits and must be stored and used in accordance with safe work practices. This unit should not be selected when Unit MEM24008B (Perform ultrasonic testing) has already been selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the

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unit of competency.	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for ultrasonic thickness testing	1.1. Inspection areas are cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures and OH&S requirements. 1.3. Inspection areas are visually assessed for obvious discontinuities.
2. Perform ultrasonic thickness testing	2.1. Nominated ultrasonic thickness test is identified from standard operating procedures. 2.2. Test equipment is prepared in accordance with standard operating procedures. 2.3. Ultrasonic tests are carried out in accordance with relevant standards and OH&S requirements. 2.4. Ultrasonic test equipment is maintained and stored in accordance with standard operating procedures and OH&S requirements.
3. Report the results of ultrasonic thickness tests	3.1. Basic thicknesses are identified and explained in accordance with enterprise standards and/or procedures. 3.2. Basic thicknesses are confirmed in accordance with enterprise standards and/or procedures. 3.3. Test results are reported in accordance with enterprise standards and/or procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques, equipment and procedures
- performing calculations
- assessing risk
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes for a variety of test surfaces
- procedures and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- basic principles of ultrasonic thickness testing
- properties and behaviour of ultrasound
- basic concepts associated with frequency, velocity, wavelength, amplitude
- generation of ultrasound
- types of discontinuities and their consequences
- procedures for carrying out ultrasonic thickness tests
- tools, equipment, techniques and system verification checks necessary to carry out the ultrasonic thickness test
- advantages and limitations of ultrasonic thickness testing
- hazards and safety requirements associated with ultrasonic thickness testing
- basic maintenance and storage procedures for testing equipment
- common basic defects
- indications and thicknesses
- methods/procedures for reporting test results
- ultrasonic thickness testing equipment
- types of displays:
  - a-scan display
  - b-scan display
- types of couplants, desirable characteristics
- straight beam testing method:
- calibration of thickness testing equipment
- frequency
- probe size and shape
- thickness testing

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REQUIRED SKILLS AND KNOWLEDGE

• plate testing
  • acceptance standards within the scope of this unit
• recording and reporting:
  • job records
  • routine reports
  • codes and standards
• variables affecting test results
• methods of controlling variables
• component variables:
  • size and geometry
  • distance location from entry surface
  • orientation to entry surface
  • reflecting characteristics of back wall
• any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards
• use and application of personal protective equipment
• safe work practices and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform ultrasonic thickness testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not

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EVIDENCE GUIDE	
	in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing ultrasonic thickness testing in a range of industrial applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying

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RANGE STATEMENT	
Obvious discontinuities	Observed changes in material homogeneity
Reported	Accurate identification of location and size of discontinuities

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24008B Perform ultrasonic testing

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers operating ultrasonic testing equipment and applying the testing procedure in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to inspecting, interpreting, classifying and reporting on ultrasonic testing techniques of fabrications, structures and components. Testing is across a wide range of industries to Level 2 (AS 3669 and AS 3998) or equivalent and includes identifying abnormalities. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific ultrasonic testing equipment as specified in maintenance documentation, testing procedures or operator instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components and structures on a wide range of applications. Ultrasonic tests are performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices.

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	Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **6**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM18001C	Use hand tools
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range

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	statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for ultrasonic testing	1.1. Inspection areas are identified, cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures, statutory and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Perform ultrasonic testing	2.1. The most appropriate ultrasonic test for the material/application is selected. 2.2. Testing equipment is selected and prepared in accordance with standards and/or procedures. 2.3. Ultrasonic test is carried out in accordance with relevant standards, specifications and OH&S requirements. 2.4. Ultrasonic testing equipment is checked for defects, and maintained and stored in accordance with procedures, OH&S requirements and manufacturer instructions.
3. Interpret and report the results of ultrasonic tests	3.1. Indications are assessed and defects are detected and classified in accordance with national and international codes and standards. 3.2. Defects are confirmed in accordance with enterprise procedures and industry practices. 3.3. Test results are reported in accordance with enterprise procedures, accepted industry practices and customer service requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- interpreting and following procedures
- identifying inspection areas
- identifying discontinuities and defects
- selecting appropriate testing techniques, equipment and procedures
- analysing test results
- reading, interpreting and applying relative testing standards
- reading, interpreting and applying relative conformance standards
- performing calculations relating to ultrasonic testing
- assessing risk
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes for a variety of test surfaces
- procedures and OH&S requirements in relation to the preparation process
- established assessment procedures and techniques
- principles of ultrasonic testing
- variables affecting test selection
- variables affecting test results
- ultrasound - frequency, velocity, wavelength, amplitude
- behaviour of ultrasound at interfaces
- characteristics of ultrasound in materials
- generation of ultrasound
- detection of ultrasound
- the flaw detector
- basic test methods:
  - pulse-echo and transmission methods
  - resonance methods
  - a, b, c, and p scan
  - types of coupling
  - single, dual and two-probe methods
- characteristics and applications associated with probes
- calibration methods
- variables

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REQUIRED SKILLS AND KNOWLEDGE

• contact and immersion test methods
• testing methods and their application
• flaw size evaluation
• interpretation and evaluation:
  • defect types as related to product
  • codes and standards
• recording and reporting:
  • job records
  • routine reports
  • codes and standards
• written procedures:
  • presentation
  • use of standards
• types of discontinuities and their consequences
• procedures for carrying out ultrasonic tests
• tools, equipment, techniques and system verification checks necessary to carry out the ultrasonic test
• advantages and limitations of ultrasonic testing
• hazards and safety requirements associated with ultrasonic thickness testing
• maintenance and storage procedures for testing equipment
• range of defects
• methods/procedures for reporting test results
• any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards
• use and application of personal protective equipment
• safe work practices and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform ultrasonic testing. Competency in this unit cannot be claimed until all prerequisites have been

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EVIDENCE GUIDE	
	satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with operating ultrasonic testing equipment and the application of the testing procedure in a range of industrial applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying
Obvious discontinuities	Observed changes in material homogeneity
Defects	Corrosion, metal fatigue, deformation in non-ferrous/ferrous alloys steels, composite materials, fatigue cracks, stress corrosion cracking, manufacturing defects, thickness measurement and fit, mechanical and bonded repairs, laminar tearing, welding defects and casting defects and/or aircraft components
Reported	Accurate identification of location and size of discontinuities

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Non-destructive testing

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MEM24009B Perform basic radiographic testing

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers performing basic radiographic testing procedures in a range of industrial applications. Knowledge of metallurgy associated with the level of application in this unit is required.

Application of the Unit

Application of the unit	This unit applies to working with ionizing radiation in open or closed sites; on fabrications, structures and components across a wide range of industries. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific radiographic testing equipment as specified in maintenance documentation, testing procedures or operators instructions. All testing must be completed with particular attention to personal and OH&S regulations. Ionizing radiation equipment materials and chemicals, which are subject to codes and regulations, must be stored, used, and transported in accordance with safe work practices. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. This unit should not be selected when Unit MEM24010B (Perform radiographic testing) has already been selected. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band**: **A**

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	Unit Weight: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM13013B	Work safely with ionizing radiation
	MEM18001C	Use hand tools

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare inspection areas ready for basic radiographic testing	1.1. Radiographic specimens are cleaned and prepared for testing using appropriate procedures and materials.

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ELEMENT	PERFORMANCE CRITERIA
	1.2. Preparation processes are carried out in accordance with the relevant procedures and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Set up radiographic test equipment	2.1. Nominated test is identified from standard operating procedures. 2.2. Radiation testing and processing equipment is set up in accordance with standard operating procedures.
3. Carry out basic radiographic tests	3.1. Basic properties of X-rays and gamma rays are identified. 3.2. Safety practices and controls for minimising radiation exposure are applied. 3.3. Radiographic testing and safety equipment is operated in accordance with relevant work instructions and OH&S requirements. 3.4. Films are processed to achieve optimum results.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • interpreting and following procedures • identifying inspection areas • identifying discontinuities and defects • selecting appropriate testing techniques, equipment and procedures • calculating and producing optimum quality radiographs • effectively designing exposure and storage areas • calculating shielding thicknesses • reading, interpreting and applying relative testing standards • reading, interpreting and applying relative conformance standards • documenting and reporting • assessing risk

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REQUIRED SKILLS AND KNOWLEDGE

Required knowledge

Look for evidence that confirms knowledge of:

- cleaning and preparation processes for a range of test surfaces
- cleaning and preparation processes for a range of test surfaces
- assessment procedures and techniques
- types of discontinuities and their consequences/effect on the material
- procedure for carrying out each radiographic test
- principal types of X-ray generators and radioisotopes and their effect on radiographic sensitivity
- tools, equipment, techniques and system verification checks
- relevant standards, regulations and codes
- hazards associated with radiographic testing
- procedures for specialised radiographic applications
- principles of image formation, film and chemical properties and processing techniques
- various types of films and screens, their properties and effects on image quality
- maintenance and storage procedures for test equipment
- common faults and damage
- safety features of radioisotope cameras and X-ray equipment
- production of X-rays and gamma rays
- absorption of ionizing radiation by matter and the biological effects on living
- X-ray equipment
- gamma ray sources
- comparison of X-ray and gamma ray sources on basis of energy and intensity
- shielding thickness
- exposure calculations
- reciprocity law
- preparation and use of exposure charts, radiographic equivalence charts
- exposure techniques
- equipment types
- recording and reporting
- safety aspects
- types of materials
- industrial applications
- set-up procedures
- methods/procedures for reporting test results
- implications of test results for the particular material/application
- any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards

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REQUIRED SKILLS AND KNOWLEDGE
• use and application of personal protective equipment • safe work practices and procedures • relevant hazards and control measures related to the competency

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform basic radiographic testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing basic radiographic testing procedures in a range of industrial applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be

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EVIDENCE GUIDE	
	gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying
Obvious discontinuities	Observed changes in material homogeneity

Unit Sector(s)

Unit sector	

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24010B Perform radiographic testing

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers operating radiographic testing equipment and applying the testing procedures in a range of industrial applications.

Application of the Unit

Application of the unit	This unit applies to inspecting, interpreting, classifying and reporting on radiographic testing techniques of fabrications, structures and components. Testing is across a wide range of industries to Level 2 (AS 3669 and AS 3998) or equivalent and includes identifying abnormalities such as corrosion, metal fatigue, deformation in non-ferrous/ferrous alloys steels, composite materials, fatigue cracks, stress corrosion cracking, manufacturing defects, thickness measurement and fit, mechanical and bonded repairs, welding defects and casting defects and/or aircraft components. The work can relate to scheduled and un-scheduled maintenance activities using general tools and specific radiographic testing equipment as specified in maintenance documentation, testing procedures or operators instructions. Actual and potential defects are to be considered, together with ongoing abnormalities in fabrications, components and structures on a wide range of applications. Radiographic tests are performed on critical component or structural zones, and may require re-assessment of competency at regular intervals in accordance with Australian standards and/or other relevant standards. All testing must be completed with particular attention to personal and OH&S regulations. Ionizing radiation equipment materials and chemicals, which are subject to codes and regulations, must be stored,

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	used, and transported in accordance with safe work practices. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Where power tools are required, Unit MEM18002B (Use power tools/hand held operations) should also be selected. Where tests require the interpretation of drawings, Unit MEM09002B (Interpret technical drawings) should also be selected. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V). **Unit Weight**: **6**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM13013B	Work safely with ionizing radiation
	MEM18001C	Use hand tools
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare inspection areas for radiographic testing	1.1. Inspection areas are identified, cleaned and prepared for testing using appropriate procedures and materials. 1.2. Preparation processes are carried out in accordance with the relevant procedures, statutory and OH&S requirements. 1.3. Inspection areas are visually assessed and obvious discontinuities are identified.
2. Select and prepare radiographic test	2.1. The most appropriate radiographic test for the material/application is selected. 2.2. Appropriate testing and processing equipment is selected and set up for various geometrise in accordance with standards and/or procedures. 2.3. Quality of radiographic test is optimised.
3. Perform radiographic testing	3.1. Radiographic tests are carried out in accordance with relevant standards, codes, specifications and OH&S requirements. 3.2. Radiographs are set up and carried out for specialised applications. 3.3. Films are processed to maximise quality of image. 3.4. Films are processed to achieve optimum results.
4. Maintain radiographic testing equipment	4.1. Radiographic testing equipment is checked for defects, maintained and stored in accordance with procedures, OH&S requirements and manufacturer instructions.
5. Monitor and ensure radiation safety	5.1. Safety controls are set up and maintained. 5.2. Exposure to radiation employees and general public is minimised. 5.3. Radiation monitoring equipment is selected and

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ELEMENT	PERFORMANCE CRITERIA
	used.
6. Interpret and report the results of radiographic tests	6.1. Conditions necessary to view and interpret radiographs are established. 6.2. Radiographs are interpreted/evaluated in accordance with applicable codes, standards and specifications. 6.3. Test results are reported in accordance with enterprise procedures, accepted industry practices and customer service requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • interpreting and following procedures • identifying inspection areas • identifying discontinuities and defects • selecting appropriate testing techniques, equipment and procedures • calculating and producing optimum quality radiographs • effectively designing exposure and storage areas • calculating shielding thicknesses • reading, interpreting and applying relative testing standards • reading, interpreting and applying relative conformance standards • documenting and reporting • assessing risk
Required knowledge
Look for evidence that confirms knowledge of: • cleaning and preparation processes for a range of test surfaces • cleaning and preparation processes for a range of test surfaces • assessment procedures and techniques • types of discontinuities and their consequences/effect on the material • procedure for carrying out each radiographic test • principal types of X-ray generators and radioisotopes and their effect on

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REQUIRED SKILLS AND KNOWLEDGE

radiographic sensitivity
- tools, equipment, techniques and system verification checks
- relevant standards, regulations and codes
- hazards associated with radiographic testing
- procedures for specialised radiographic applications
- principles of image formation, film and chemical properties and processing techniques
- various types of films and screens, their properties and effects on image quality
- maintenance and storage procedures for test equipment
- common faults and damage
- safety features of radioisotope cameras and X-ray equipment
- production of X-rays and gamma rays
- absorption of ionizing radiation by matter and the biological effects on living
- X-ray equipment
- gamma ray sources
- comparison of X-ray and gamma ray sources on basis of energy and intensity
- shielding thickness
- exposure calculations
- reciprocity law
- preparation and use of exposure charts, radiographic equivalence charts.
- exposure techniques
- equipment types
- recording and reporting
- safety aspects
- types of materials
- industrial applications
- set-up procedures
- methods/procedures for reporting test results
- implications of test results for the particular material/application
- any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards
- use and application of personal protective equipment
- safe work practices and procedures
- relevant hazards and control measures related to the competency

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform radiographic testing. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with operating radiographic testing equipment and applying testing procedures or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Preparation processes	Surface cleaning and drying

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24011B Establish non-destructive tests

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers researching, analysing, developing, approving and evaluating non-destructive tests (NDT).

Application of the Unit

Application of the unit	This unit applies to research, development, approval and evaluation of applicable non-destructive tests on fabrications, structures and components across a wide range of industries to Level 3 (AS 3669 and AS 3998) or equivalent. The work can relate to scheduled and unscheduled maintenance activities using general tools and specific testing equipment, test development procedures or guidelines. Activities should replicate 'in-service' tasks due to the high level of self-supervision and the critical nature of the work. Actual and potential defects are considered, together with ongoing abnormalities in fabrications, components, structures from a wide range of applications by the selection of relevant testing method. Tests are validated/evaluated on critical component or structural zones. All testing must be developed and completed with particular attention to personal safety and OH&S regulations. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712. Materials and chemicals which are subject to codes and regulations - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - are subject to safe work habits and must be stored and used in accordance with safe work practices. This unit should not be selected when Unit MEM05025C

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	(Perform welding fabrication inspection) has already been selected. **Band**: **B** **Unit Weight**: **12**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM13013B	Work safely with ionizing radiation
	MEM16010A	Write reports
	MEM18001C	Use hand tools
	MEM24002B	Perform penetrant testing
	MEM24004B	Perform magnetic particle testing
	MEM24006B	Perform eddy current testing
	MEM24008B	Perform ultrasonic testing
	MEM24010B	Perform radiographic testing
	MEM24012C	Apply metallurgy principles

Employability Skills Information

Employability skills	This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Assess requirements for non-destructive test	1.1. Inspection area is assessed for testing and all possible failure sites are identified utilising metallurgical analysis. 1.2. Relevant information for test development is collected from available sources using accepted techniques. 1.3. Information is analysed and interpreted. 1.4. Test requirements are determined.
2. Establish non-destructive test techniques and procedures	2.1. Test methods, techniques and procedures to be used for specific NDT work are designated. 2.2. Codes, standards, specifications and procedures are interpreted. 2.3. Test procedures are developed in accordance with established techniques and metallurgical principles.
3. Validate/confirm non-destructive tests	3.1. General and specific test procedures are validated in accordance with established techniques. 3.2. Inspection results are interpreted and evaluated in terms of existing codes, standards and specifications.
4. Approve non-destructive test procedures	4.1. Procedures are approved in accordance with workplace procedures and relevant codes and standards. 4.2. Procedures are documented and distributed in accordance with workplace requirements and relevant codes and standards.
5. Evaluate non-destructive test procedures	5.1. Procedures are evaluated for effectiveness. 5.2. Evaluation results are documented and reported according to workplace requirements. 5.3. Changes/amendments to non-destructive test

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ELEMENT	PERFORMANCE CRITERIA
	procedures are made and distributed as necessary.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • conducting metallurgical assessment of inspection areas • designating most appropriate method, technique or procedure • referencing information • developing and validating test procedures • applying safety procedures, standard operating procedures and legislative requirements to all work • reading/interpreting/applying relative testing standards • reading/interpreting/applying relative conformance standards • documenting procedure and results
Required knowledge
Look for evidence that confirms knowledge of: • application of metallurgical analysis to assess inspection areas • NDT methods, techniques and procedures • meaning and validity of relevant codes, standards, specifications and procedures • test procedure for testing techniques and specimen • validation processes • process for approval of procedures • process for documentation/distribution of procedures • evaluation procedures • process for documentation of evaluation results • process for amending tests and distributing amendments • any applicable industry standards, national/Australian standards, NOHSC guides, State/Territory regulatory codes of practice/standards • use and application of personal protective equipment • safe work practices and procedures • relevant hazards and control measures related to the competency

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to establish non-destructive tests. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with the research, analysis, development, approval and evaluation of non-destructive tests, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and

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EVIDENCE GUIDE	
	documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Unit Sector(s)

Unit sector	

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM24012C Apply metallurgy principles

Modification History

Single band identifier removed to clarify dual status

Unit Descriptor

Unit descriptor	This unit covers applying basic metallurgy principles related to selecting appropriate non-destructive testing techniques (NDT) and interpreting the results of NDT tests for metallurgical processes.

Application of the Unit

Application of the unit	This unit applies to knowledge of metallurgy principles, and the relationship between the various non-destructive testing methods and their capabilities and limitations when applied to the detection of specific discontinuities in metals and alloys. The unit applies to employees other than NDT technicians such as metallurgists, welding supervisors etc. who select and order NDT tests and who interpret results provided by tests for metal manufacturing, casting, shaping, and joining processes. The unit does not apply to the conduct of NDT tests. Such variables as the type of discontinuity, manufacturing process and limitations will assist in determining the sequence of testing and the ultimate selection of one non-destructive test method in preference to another. Any testing that may be carried out must be completed with particular attention to personal and OH&S regulations. Where materials and chemicals which are subject to codes and regulations are stored and used - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - safe work habits must be considered. **Band:** This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit

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	for progression to C5 (AQF level V). **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

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ELEMENT	PERFORMANCE CRITERIA
1. Interpret and apply the principles of solidification and crystal structures in metals and alloys	1.1. Principles of solidification and crystal structures in metals and alloys are interpreted and applied in relation to NDT techniques.
2. Interpret equilibrium diagrams for metals and alloys	2.1. Equilibrium diagram for metal or alloy is correctly sourced 2.2. Equilibrium diagrams are correctly interpreted.
3. Interpret and apply the principles of fusion welding of metals and alloys	3.1. Principles and methods for fusion welding of metals and alloys are applied to NDT test selection. 3.2. Defects in weldments are identified and classified from NDT test results.
4. Interpret and apply the principles of the formation of castings	4.1. Principles and methods used to produce metal castings are applied to NDT test selection. 4.2. Defects in metal and alloy castings are identified and classified from NDT test results.
5. Interpret and apply the principles of steel forging	5.1. Principles and methods used to produce steel forgings are applied to NDT test selection. 5.2. Defects in steel forgings are identified and classified from NDT test results.
6. Interpret and apply the principles of mechanical testing	6.1. Principles of mechanical testing are applied to NDT test selection. 6.2. Defects in metal product are identified and classified from NDT test results

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • research • understanding and applying metallurgy principles • selecting NDT test appropriate to metal or alloy and manufacturing process

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REQUIRED SKILLS AND KNOWLEDGE

Required knowledge

Look for evidence that confirms knowledge of:

- principles of solidification and crystal structures in metal:
  - classification of materials
  - structure of atoms
  - process of solidification
  - crystal structures
  - defects formed during solidification
  - modification of crystal structure
  - heat treatment processes
  - defects formed during heat treatment
- meaning of equilibrium diagrams representative of a range of metals including aluminium, iron, steel and common non-ferrous alloys:
  - alloy systems
  - solid and liquid solubility
  - basic equilibrium diagrams
  - equilibrium diagrams for common alloys
- principles of fusion welding in relation to NDT testing
- defects in fusion welding:
  - processing defects
  - grinding cracks
  - pickling cracks
  - heat treatment cracks
  - service defects
  - fatigue cracks
  - corrosion and stress corrosion cracks
- principles of the formation of castings
- defects in castings
- principles of steel forging
- defects in steel forging
- principles of mechanical testing:
  - mechanical testing
  - tensile testing
  - impact testing
  - hardness testing
  - fatigue testing
- other tests

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to apply metallurgy principles to NDT test selection and interpretation. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying basic metallurgy principles as related to non-destructive testing techniques, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate

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EVIDENCE GUIDE	
	must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Principles and methods for fusion welding of metals and alloys	• MMAW • SAW • GMAW • GTAW • FCAW
Defects in weldments	Cracks, lack of fusion, cavities, imperfect shape, solid inclusions, miscellaneous
Defects in metal and alloy castings	Shrinkage cavities, hot tears, cold cracks, gas holes
Principles and methods used to produce steel forgings	Deformations, strengthening mechanisms, annealing
Principles of mechanical testing	Impact, tensile, hardness testing

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Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Non-destructive testing

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MEM25001 Apply fibre-reinforced materials

Modification History

Release 1. Supersedes and is equivalent to MEM25001B Apply fibre-reinforced materials

Application

This unit of competency defines the skills and knowledge required to apply and form/shape fibre-reinforced materials using manual and mechanical methods in marine vessel and aircraft construction applications.

It applies to application and forming operations conducted within a mould or over a former assembly and tasks include lay-up practices and sheathing applications using a variety of glass reinforcements and other fibres.

Where forming and integration work and vacuum bagging techniques are required unit MEM25002 Form and integrate fibre-reinforced structures should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare for application/ forming operations**	2.1	Select appropriate tools and equipment according to organisational requirements and instructions
		2.2	Set up and adjust equipment ready for operation
		2.3	Identify and select materials according to the required job specifications
		2.4	Make allowances for thickness to specifications
3	**Apply reinforced materials**	3.1	Position components ready for reinforcement operation
		3.2	Start up equipment, shut down and operate according to SOPs
4	**Form and shape reinforcement materials**	4.1	Roll/shape materials to specified thicknesses and/or finishes
		4.2	Laminate materials according to specifications
		4.3	Check final application and shape for compliance to specifications and adjust, as necessary

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Applications include one (1) or more of the following:

- hull
- deck
- superstructures
- bulkhead and partitions
- transverse and longitudinal frame members
- engine beds
- tanks

Materials include one (1) or more of the following:

- variety of glass reinforcements and other fibres
- types of laminating resins
- stiffening materials, including:
  - foams
  - core mat

Tools and equipment include one (1) or more of the following:

- brushes and rollers
- metal rollers
- gel coat
- resin depositors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25001B Apply fibre-reinforced materials

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25001 Apply fibre-reinforced materials

Modification History

Release 1. Supersedes and is equivalent to MEM25001B Apply fibre-reinforced materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting equipment for the application/forming job and setting up and operating/adjusting equipment for correct operation
- selecting materials to suit different operations and making allowances to suit conditions and specifications
- positioning components and applying reinforced materials and rolling/shaping material smoothing irregularities and laminating materials ensuring compliance with specifications and adjusting, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools and equipment for application/forming operations
- procedures for setting up and adjusting equipment
- terminology and information relevant to standard work instructions
- applicable codes and regulations
- different chemicals and materials and their properties, including mixing ratios
- importance and relevance of thickness allowances
- techniques for positioning components
- safety requirements and start-up/shutdown/operating procedures
- methods for rolling and shaping and problems associated with rolling and shaping and methods for rectifying
- lamination sequence
- methods of checking final application and form.

Assessment Conditions

- Assessors must:

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  - have vocational competency in applying fibre-reinforced materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25002 Form and integrate fibre-reinforced structures

Modification History

Release 1. Supersedes and is equivalent to MEM25002B Form and integrate fibre-reinforced structures

Application

This unit of competency defines the skills and knowledge required to apply, form and integrate fibre-reinforced components using manual and mechanical methods in marine vessel and aircraft construction applications.

It applies to component construction carried out for mould installation, and application and forming operations conducted within a mould or over a former assembly using a variety of glass reinforcements and other fibres.

Where mark off/out skills is required unit MEM12007 Mark off/out structural fabrications and shapes should also be selected.

Where straightforward application of fibre-reinforced materials and no forming or integrating is required unit MEM25001 Apply fibre-reinforced materials should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Form components**	2.1	Select relevant materials for component construction
		2.2	Select relevant drawings and templates
		2.3	Form components to specifications
		2.4	Ensure component sizing matches the appropriate template
3	**Integrate components**	3.1	Determine integration requirements, materials fixing/bonding methods and mixing practices from job specifications and manufacturer specifications
		3.2	Set up and adjust equipment ready for operation
		3.3	Fix/bond components in accordance with job requirements and specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		3.4 Form/shape reinforcement materials to specifications
		3.5 Prepare component for encapsulation process
		3.6 Clean excess bonding material and dispose of waste following SOPs
4	**Undertake post-curing of materials**	4.1 Select post-curing method to suit job application
		4.2 Set up equipment/accessories for post-curing
		4.3 Store equipment/accessories according to SOPs
		4.4 Disassemble, clean and store equipment and accessories following SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Application and forming operations include one (1) or more of the following:	• lay-up practices • post-curing practices • core materials for stiffening application • sheathing applications using resins, adhesives, sealants and fillers • vacuum bagging techniques, where applicable

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Products/components constructed include one (1) or more of the following:	• hull • deck • superstructures • bulkhead and partitions • transverse and longitudinal framing • engine beds • tanks

Materials include one (1) or more of the following:	• types of laminating resins
	• hardeners
	• releasing agents
	• pigments
	• fillers
	• variety of glass reinforcements and other fibres
	• stiffening materials, including:
	  • foams
	  • core mat

Tools and equipment include one (1) or more of the following:	• brushes and rollers • metal rollers • gel coat • resin depositors • vacuum bagging equipment • hand and power tools • workshop machinery

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25002B Form and integrate fibre-reinforced structures

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25002 Form and integrate fibre-reinforced structures

Modification History

Release 1. Supersedes and is equivalent to MEM25002B Form and integrate fibre-reinforced structures

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings/templates to form and integrate fibre-reinforced structures
- selecting and gathering materials for the construction purpose
- selecting and using the appropriate hand and power tools, workshop equipment and machinery and checking component dimensions for compliance against templates/drawings in accordance with specifications
- selecting and mixing fixing/bonding materials in accordance with job specifications using appropriate tools and equipment
- selecting adhesive/filler materials and applying fixing/bonding methods for component integration and cutting and shaping/bevelling foams and timber/plywood reinforcements to specifications
- cleaning excess fixing/bonding material and disposing of waste following SOPs
- selecting post-curing method to suit job application
- disassembling, cleaning and storing equipment/accessories in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- typical components, fibre reinforcement and core materials, resins and hardeners, fillers, release agents and pigment additives, their attributes and their uses
- chemical and physical properties of resins, mixing ratios, laminate thicknesses, strengths and curing properties
- drawings and templates and their construction role
- applicable codes and regulations
- hand tools, power tools, workshop equipment and machinery and their use

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- method used to check component dimensions against drawings, templates and specifications
- procedures used to install component, fixing/bondage and mixing application
- methods of component integration
- procedures required in setting up and adjusting equipment
- relevant adhesive/filler and fixing/bonding methods
- procedures for forming/shaping and tools/machinery used
- importance of cleaning excess fixing/bondage material and waste disposal obligations and regulations
- post-curing methods, procedures and applications
- storage procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in forming and integrating fibre-reinforced structures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25003 Set up marine vessel structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25003 Set up marine vessel structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25003B Set up marine vessel structures.

Application

This unit of competency defines the skills and knowledge required to set up marine vessel structures using straightforward levelling and alignment procedures.

Structures requiring a location/erection process using framework would typically be those where fairness and load bearing is critical and/or where building/marine regulations can apply. Specifications for the structure would be supplied via engineering drawings or similar and include site location information.

This unit does not include fixed structures, including jetties, wharves and moorings.

Where construction and assembly of entirely marine timber components is undertaken unit MEM25005 Construct and assemble marine vessel timber components should also be selected.

Where lifting or rigging skills are required appropriate materials handling units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and prepare site**	2.1	Check the site for location, dimensions and levels in accordance with industry standards
		2.2	Undertake minor alterations, corrections or adjustments with approval of appropriate authority
		2.3	Prepare surfaces and materials/components for use
		2.4	Identify structural components and materials

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Undertake levelling and measurement readings**	3.1	Apply principles of levelling and measurement reading
		3.2	Determine task requirements
		3.3	Identify levelling procedures
		3.4	Select levelling equipment and set up according to SOPs
		3.5	Take levelling measurements
		3.6	Complete levelling tasks to specifications
4	**Erect marine vessel structures**	4.1	Prepare components of structure for sequential erection
		4.2	Erect components and fix according to specifications
		4.3	Ensure structure alignment meets required specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Structures include one (1) or more of the following:	• composite • metal • timber
Framework includes one (1) or more of the	• hull framing • deck framing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

following:	• superstructures • jig construction • stairways • walkways • tanks • platforms • cradles composites
Materials include one (1) or more of the following:	• timber • other non-metallic materials
Levelling and alignment includes one (1) or more of the following:	• plumb bob/lines • spirit levels • water and dumpy levels • laser levels • electronic levels

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25003 Set up marine vessel structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25003B Set up marine vessel structures.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25003 Set up marine vessel structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25003 Set up marine vessel structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25003B Set up marine vessel structures.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and confirming relative structural components and materials species/types against job specifications
- checking the construction site location for dimensions and levelling and carrying out minor alterations, corrections and adjustments to ensure site is ready in consultation with the appropriate authority, including supervisor, customer and surveying agency
- undertaking levelling and alignment procedures using appropriate tools, equipment and methods and making adjustments where required to establish alignment requirements and erecting levelled structures in accordance with specifications and procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- practices used for checking construction site location, dimensions and levelling procedures
- procedures for effecting authorised minor alterations, correction or adjustment
- practices used to prepare surfaces, materials/component structures
- structural components and material species/types
- process for obtaining levelling and measurement reading
- levelling and measurement equipment/tools and methods used to level equipment/component assembly structure
- engineering principles, techniques, set-up procedures and tools for levelling and measurement
- sequence of assembly of component structure
- erecting and fixing methods.

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Assessment Conditions

- Assessors must:
  - have vocational competency in setting up marine vessel structures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25004 Fair and shape surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM25004B Fair and shape surfaces

Application

This unit of competency defines the skills and knowledge required to fill, sand, fair and grind to achieve uniform or correct contours and surfaces on marine vessels and other transport vehicles.

Where slipping is required, or when working on a slipped craft unit MEM25014 Perform marine slipping operations should also be selected.

Where relevant units related to specific applications and materials are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions and determine sequence of operations
2	**Prepare for filling/sanding/ grinding operations**	2.1	Set up safety equipment in accordance with procedures
		2.2	Select appropriate fillers and abrasive materials and prepare to suit job requirements and required surface finish
		2.3	Select appropriate equipment and accessories and set up ready for operation
3	**Perform filling, sanding, fairing and grinding operations**	3.1	Carry out work to specified finishes using appropriate tools and techniques
		3.2	Use power tools to optimise equipment and material use
		3.3	Check surfaces to ensure compliance to specifications
		3.4	Make adjustments and corrections as required

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools include one (1) or more of the following:	• electric or pneumatic disc • orbital and belt sanders • 'torture-boards' • straight and angle grinders • die grinders can be used for certain applications but should not be used as the sole tool for assessment purposes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25004B Fair and shape surfaces

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25004 Fair and shape surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM25004B Fair and shape surfaces

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and selecting materials to be prepared
- setting up safety equipment, including fans and extraction unit, in accordance with procedures
- selecting and preparing appropriate fillers and abrasive materials for required surface finish
- setting up and using a selection of hand and power tools using associated safety accessories, including dust extraction assemblies and guard protection
- surface filling and internal and external sanding to achieve flat, concave and convex surfaces
- checking surfaces to ensure compliance visually and by the use of fairing battens, straightedges, stringlines, french curves and templates.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- filling and fairing specifications
- types, properties and characteristics of fillers and materials to be prepared and features/specific preparation requirements
- filler ingredient measuring and preparation techniques
- relevant safety equipment and uses/application
- filling, fairing and shaping techniques
- equipment and accessories and applications
- means of optimising life of abrasive materials and reducing waste
- compliance testing procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in fairing and shaping surfaces at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25005 Construct and assemble marine vessel timber components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25005 Construct and assemble marine vessel timber components (Release 1).

Release 1. Supersedes and is equivalent to MEM25005B Construct and assemble marine vessel timber components.

Application

This unit of competency defines the skills and knowledge required to construct and assemble marine timber components, including laminating by cold processes, and applies to marine vessel backbone components.

Where hull is to be planked, planking can include carvel, strip, clinker and double diagonal systems.

Where permanent timber bending practices are required including boiling/steam bending then see unit MEM25009 Form timber shapes using hot processes.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Construct marine vessel timber components**	2.1	Select appropriate tools/equipment to suit job application
		2.2	Select template/measurement to suit component construction
		2.3	Ensure material is dressed, sized and shaped to suit job requirements and specifications
		2.4	Check final form/shape of component against template/measurement specification and modify, as necessary
		2.5	Apply component identification and set-up markings

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Assemble components**	3.1 Set up jig support assembly to suit job requirements
	3.2 Select materials for fastening, joining and sealing and use according to job specifications and requirements
	3.3 Determine assembly and fastening sequence
	3.4 Carry out material preservation requirements, as required
	3.5 Assemble components to specified line markings and positions
	3.6 Ensure assembled component meets specifications
	3.7 Clean/prepare component assembly to suit job requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Marine vessel backbone components include one (1) or more of the following:	• keel • deadwoods • stem • transverse and longitudinal framing • knees • deck framing • hull construction • laid deck construction • superstructures
Materials include one (1) or more of the following:	• hardwood • softwood • plywood sheeting • a combination
Tools and equipment include one (1) or more of the following:	• hand and hand held power tools • workshop equipment • bandsaw • surfacer • thicknesser
Fastening methods include one (1) or more of the following:	• marine-grade adhesives • sealant and caulking materials • metal fasteners (copper/silicon bronze/monel/stainless steel)

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25005 Construct and assemble marine vessel timber components (Release 1).

Release 1. Supersedes and is equivalent to MEM25005B Construct and assemble marine vessel timber components.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25005 Construct and assemble marine vessel timber components

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25005 Construct and assemble marine vessel timber components (Release 1).

Release 1. Supersedes and is equivalent to MEM25005B Construct and assemble marine vessel timber components.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting drawings, procedures, templates, construction details, assembly practices and material types to construct and assemble marine vessel timber components
- cutting/sizing and preparing and forming/shaping timber against template/measurement specifications and modifying as required and checking final form/shape against job specifications for compliance
- assembling supporting jigs to suit job requirements
- selecting and using fastening methods and determining fastening sequence
- finishing and applying preservation materials, cleaning excess material wastage and undertaking disposal of waste in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- component types/materials/templates and their uses
- characteristics, properties, specifications and uses of species, including durability, strength and appearance
- types, specification and uses of fasteners
- applicable codes and regulations
- methods used to take off measurements, mark out, construct and assemble components
- effect on access, rigidity, strength, buoyancy and resistance to stresses encountered at sea
- hand tools, power tools and workshop machinery to suit construction applications
- practices for cutting/dressing/sizing/shaping material

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- measuring and marking out techniques using graduated devices, battens and templates
- procedures used in checking final form/shape
- clamping and shoring methods and the use of jigs
- procedures, codes and regulations used in applying relevant fastenings to suit assembly
- methods of cleaning, preserving and finishing components, their uses and safety precautions
- waste disposal obligations and regulations.

Assessment Conditions

- Assessors must:
  - have vocational competency in constructing and assembling marine vessel timber components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25006 Undertake marine sheathing operations

Modification History

Release 1. Supersedes and is equivalent to MEM25006B Undertake marine sheathing operations

Application

This unit of competency defines the skills and knowledge required to apply sheathing to marine structures (sheathing operations).

Tasks can be carried out on prepared new and old surface areas and sealing can involve various materials to ensure a watertight seal on a variety of components.

Where application of marine coatings is undertaken unit MEM08002 Pre-treat work for subsequent surface coating and/or unit MEM08004 Finish work using wet, dry and vapour deposition methods, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM25001	Apply fibre-reinforced materials
MEM25004	Fair and shape surfaces

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare surface areas and apply materials**	2.1	Prepare application material in accordance with manufacturer specifications
		2.2	Prepare surface area to suit job application
		2.3	Remove surface contaminants using appropriate method
		2.4	Protect non-contact surface areas, where applicable
		2.5	Apply measures to prevent external contamination in accordance with organisational procedures
		2.6	Use appropriate equipment to calibrate mixing quantities
		2.7	Select hand tools for mixing and application to suit job requirements
3	**Prepare and apply application materials**	3.1	Prepare/mix materials in accordance with manufacturer specifications
		3.2	Calculate material quantities and cut to produce minimum wastage
		3.3	Select and use application tools

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Carry out application procedures in accordance with manufacturer specifications
	3.5 Hold job materials securely in place until curing process is achieved, where applicable
	3.6 Remove excess material
	3.7 Clean up application tools and store
	3.8 Clean up job area to maximise safe working conditions
4 **Seal fabricated components**	4.1 Complete surface preparation in accordance with manufacturer specifications
	4.2 Apply sealant to components and secure in accordance with specifications and/or drawings
	4.3 Clean off excess sealant and test/check to ensure water tightness

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Surface materials include one (1) or more of the following:	• copper • gal sheet and other metals • fabric • sheathing resins • adhesives

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- sealants
- fillers

Hand tools for mixing and application include one (1) or more of the following:

- mixing sticks
- putty/broad knives
- scales
- tins of equal size
- trowels
- squeegee
- brushes
- rollers

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25006B Undertake marine sheathing operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25006 Undertake marine sheathing operations

Modification History

Release 1. Supersedes and is equivalent to MEM25006B Undertake marine sheathing operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and clarifying sheathing application, material and other relevant specifications for undertaking marine sheathing operations
- preparing surface materials and measuring sheathing lengths to produce minimal wastage to suit job application
- preparing surface area, including removal of contaminants and shielding surface areas not being sheathed
- selecting hand and power tools to mix solutions in correct ratios and applying in accordance with manufacturer specifications
- securing matting/cloth and waste overhang and holding job materials securely in place until curing process is achieved
- removing excess materials to produce minimum sanding/finishing requirements and disposing of waste in accordance with legislative requirements
- applying sealant to components and testing/checking to ensure water tightness.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sheathing material specifications, properties and uses
- surface types, specifications, cleaning and preparation techniques
- site and sheathing preparation
- sealant types, specifications, application and finishing techniques
- masking procedures
- bonding/impregnating/reinforcing material specifications, properties and uses
- use of tools for sizing, measuring, mixing, applying sheathing and bonding/impregnating/reinforcing mixtures and finishing
- sheathing applications

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- waste minimisation techniques and waste disposal obligations and regulations
- methods for securing materials and waste overhang
- techniques/procedures for removal of excess resin
- methods for cleaning and storage of tools
- sanding/re-coating procedures
- water testing techniques.

Assessment Conditions

- Assessors must:
  - have vocational competency in undertaking marine sheathing operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25007 Maintain marine vessel surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM25007B Maintain marine vessel surfaces

Application

This unit of competency defines the skills and knowledge required to perform cosmetic maintenance/repair of marine vessel surfaces during routine maintenance-related inspection of hull and superstructure sectors, surfaces and fittings.

Where repair of marine surfaces and structures is required to be carried out unit MEM25008 Repair marine vessel surfaces and structures should also be selected.

Where slipping is required, or when working on a slipped craft unit MEM25014 Perform marine slipping operations should also be selected.

Where relevant units related to specific applications and materials are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
		1.5	Identify sectors, surfaces and fittings requiring inspection
		1.6	Establish condition of sectors/surfaces and fittings
		1.7	Establish appropriate cosmetic maintenance/repair requirements and methods
		1.8	Identify and take action to minimise risks associated with toxic materials
2	**Clean and prepare vessel sectors and surfaces**	2.1	Select and use correct cleaning tools, equipment and materials
		2.2	Clean fittings and prepare for maintenance
		2.3	Ensure surfaces and sectors are cleaned and free of contaminants
3	**Perform cosmetic maintenance/ repair and finish surfaces**	3.1	Prepare surfaces, fill and fair ready for finishing
		3.2	Confirm compatibility of re-coating material
		3.3	Select and apply material coatings
		3.4	Maintain/replace fittings, as appropriate

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.5 Clean tools and equipment and store according to SOPs
	3.6 Re-coat surfaces, where applicable
	3.7 Sand surfaces and buff/polish to specification, where applicable

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Surfaces include one (1) or more of the following:	• fibre reinforced plastics • timber • metal
Cosmetic maintenance/ repair includes one (1) or more of the following:	• chips in fibre reinforced plastics • minor corrosion in metal • caulking in timber surfaces • wear and corrosion of fittings
Cleaning tools, equipment and materials include one (1) or more of the following:	• hand scrapers and scouring pads • hand held power tools • abrasive materials and equipment and associated dust extraction accessories • high-pressure blast cleaning equipment • chemical cleaners, including acid wash, solvent and detergents

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25007B Maintain marine vessel surfaces

Links

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Assessment Requirements for MEM25007 Maintain marine vessel surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM25007B Maintain marine vessel surfaces

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications to establish appropriate cosmetic maintenance/repair requirements, including cosmetic environmental and other damage
- identifying surface coating of different sectors of the marine vessel surfaces and detecting faults, flaws and breakdown in surface integrity
- identifying and taking actions to minimise risks associated with toxic materials
- selecting and using appropriate cleaning tools, equipment and materials to clean/etch surfaces
- removing fittings and preparing parts/sections in need of repair and carrying out repairs using and applying fillers, caulking compounds, sealants, adhesives and gel coats, where required
- preparing surfaces in readiness for application of surface finishing and protective coatings and applying/restoring in accordance with procedures and reinstalling/replacing fittings.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- structure, component, and surface type identification
- written and verbal instruction and specification
- range of cleaning/etching/cutting solutions and compounds
- protective and preservative coatings
- fault and blemish identification
- types of fillers, caulking, sealants, adhesives and their uses
- operation of hand and mechanical tools including high- pressure cleaning devices
- methods of cleaning, performing cosmetic repair and surface preparation, finishing and preservation
- environmental impact of run-off and waste

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- waste disposal obligations and regulations.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining marine vessel surfaces at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25008 Repair marine vessel surfaces and structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25008 Repair marine vessel surfaces and structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25008B Repair marine vessel surfaces and structures.

Application

This unit of competency defines the skills and knowledge required to repair marine vessel structures and surfaces and chosen repair methods must take account of stresses encountered by vessels at sea.

Where mechanical systems/components/fittings are to be replaced unit MEM18055 Dismantle, replace and assemble engineering components should also be selected.

Where location/erection of structures is required unit MEM25003 Set up marine vessel structures should also be selected.

Where sheathing applications are required unit MEM25006 Undertake marine sheathing operations should also be selected.

Where cosmetic maintenance/repair of surfaces is required unit MEM25007 Maintain marine vessel surfaces should also be selected.

Where slipping is required, or when working on a slipped craft, unit MEM25014 Perform marine slipping operations should also be selected.

Where relevant units related to specific applications and materials are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

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Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM25004	Fair and shape surfaces
MEM25007	Maintain marine vessel surfaces

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify damaged structural areas/sectors and determine extent of damage

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.5	Determine repair requirements
2	**Remove and repair damaged sectors**	2.1	Reinforce/support damaged sector, where applicable
		2.2	Remove damaged sector
		2.3	Determine method of component replacement
		2.4	Repair/construct damaged components to specification using appropriate tools/equipment, materials and techniques
		2.5	Fasten components using appropriate fastening practices
		2.6	Prepare repaired surface area and re-coat to specifications
		2.7	Clean repairs in accordance with delivery requirements

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Structures include one (1) or more of the following:	• hull • superstructure • decks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Surfaces include one (1) or more of the following:	• fibre reinforced plastics • timber • metal • polycarbonates • acrylics • glass
Stresses encountered by vessels at sea include one (1) or more of the following:	• hogging • sagging • wracking • sheering • panting
Damage includes one (1) or more of the following:	• foreign contact damage, including reef and jetty collision • environmental problems, including fungi, marine and insect effects on timber • variants of severe corrosion in metals, including electrolysis and galvanic corrosion • holed hull • star-cracking in fibre reinforced plastics • hull penetration causing ingress of water
Repairs include one (1) or more of the following:	• fibre reinforced plastics construction, including osmosis • structural repair, including impediments to structural and watertight integrity • replacement of hull and deck • planking • replacement of cracked hatch tops and portlight windows

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25008 Repair marine vessel surfaces and structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25008B Repair marine vessel surfaces and structures.

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Assessment Requirements for MEM25008 Repair marine vessel surfaces and structures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25008 Repair marine vessel surfaces and structures (Release 1).

Release 1. Supersedes and is equivalent to MEM25008B Repair marine vessel surfaces and structures.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying the type and extent of structural damage to the area/sector
- selecting and preparing the suitable repair method and materials and appropriate tools and equipment to undertake the task
- disassembling components, where required, and undertaking repair damage to surfaces and structures to specifications
- reassembling and/or replacing components and reconnecting/refitting through-hull fittings
- preparing surface for application of surface finishes and protective coatings matching colours and textures to specifications
- testing and re-establishing watertight integrity in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- structure, component, surface and core identification
- effect of damage in relation to the integrity of the hull and structures and the capacity of the vessel to withstand stresses encountered at sea
- repair methods and materials for timber, fibre reinforced plastics, and metal surfaces and structures
- characteristics of chosen materials
- affect on structural and or watertight integrity
- tools/equipment, their specification and application
- techniques for reinforcement/shoring/support
- methods for re-constructing damaged components

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- fastening methods and application procedure
- procedures used in preparing, re-finishing or re-coating and types and applications of coatings
- colour and texture matching techniques
- methods of testing and re-establishing watertight integrity
- procedures for pre-delivery clean-up of damaged sector.

Assessment Conditions

- Assessors must:
  - have vocational competency in repairing marine vessel surfaces and structures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25009 Form timber shapes using hot processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25009 Form timber shapes using hot processes (Release 1).

Release 1. Supersedes and is equivalent to MEM25009B Form timber shapes using hot processes.

Application

This unit of competency defines the skills and knowledge required to form solid timber shapes using hot processes within a mould, existing structure or over a former assembly.

Where complex forming is required unit MEM09021 Interpret and produce drawings of curved 3-D shapes should also be selected.

Where straightforward construction and assembly of marine timber components is undertaken, including laminating by cold processes, unit MEM25005 Construct and assemble marine vessel timber components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare to form timber shapes**	2.1	Select appropriate bending process and identify components
		2.2	Determine construction sequence
		2.3	Select and use tools and equipment appropriate to job requirements
3	**Form timber shapes**	3.1	Select standard jigs/templates to suit job application
		3.2	Construct jigs/templates to suit required shape
		3.3	Construct components to specifications using hot processes

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Set up laminating/heating equipment according to SOPs, where applicable
	3.5 Construct and shape components to specifications
	3.6 Ensure final components conform to specifications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Tools and equipment include one (1) or more of the following:	• jigs • templates • steam boxes • cramps • fasteners

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25009 Form timber shapes using hot processes (Release 1).

Release 1. Supersedes and is equivalent to MEM25009B Form timber shapes using hot processes.

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Assessment Requirements for MEM25009 Form timber shapes using hot processes

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25009 Form timber shapes using hot processes (Release 1).

Release 1. Supersedes and is equivalent to MEM25009B Form timber shapes using hot processes.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications and drawings to select jig/template or fastening method relevant to form application
- selecting timber from drawing according to specifications and identifying any faults
- preparing and operating heating/steaming equipment using appropriate tools, jigs, moulds and templates to construct components to specifications
- bending, shaping, assembling and/or positioning timber components for clamping or fastening and fixing securely
- checking final component for compliance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- relevant job specifications
- forming and component assembly practices
- heating/steaming equipment types and application
- heating times, temperatures and humidity requirements, where appropriate
- timber types, specifications and characteristics
- fault identification in material, including twist, shakes and sloping grain
- forming and component assembly practice
- jig/templates types and their application
- jig/template construction process to suit specified shape
- bending and forming processes used for constructing components
- relevant laminating/heating equipment, their use and safety procedures

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- heating, construction and shaping of components
- checking specified component size.

Assessment Conditions

- Assessors must:
  - have vocational competency in forming timber shapes using hot processes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25010 Perform fitout procedures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25010 Perform fitout procedures (Release 1).

Release 1. Supersedes and is equivalent to MEM25010B Perform fitout procedures.

Application

This unit of competency defines the skills and knowledge required to fit out marine vessels.

It includes set out, construction, assembly and installation of a variety of components and also includes the installation of thermal, noise, vibration and fire control insulation materials.

This unit applies to both 'on the job' and 'pre-fabricated structure fitouts' and all work is carried out safely to specified industry standards for timber joinery, surface finish, appearance characteristics, dressing or plugging of fastenings.

Where lines plan drawings and loftings are required to be interpreted unit MEM09021 Interpret and produce drawings of curved 3-D shapes should also be selected.

Where straightforward installation of fittings/accessories is required unit MEM18002 Use power tools/hand held operations should also be selected.

Where construction of fibre reinforced plastics components are required to be undertaken unit MEM25002 Form and integrate fibre-reinforced structures should also be selected.

Where construction of solid timber shapes using hot processes is required to be undertaken unit MEM25009 Form timber shapes using hot processes should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

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Pre-requisite Unit

MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM25005	Construct and assemble marine vessel timber components

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, fitout plans, job sheets or work instructions

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
2	**Construct fitout components**	2.1	Identify materials for fitout from fitout plans
		2.2	Check take-off quantities and produce cutting list, if required
		2.3	Machine material to suit job scantling sizes, strength and appearance requirements
		2.4	Mark/cut out materials to specification
		2.5	Identify components requiring assembly and determine the sequence of assembly
3	**Assemble fitout components**	3.1	Identify method of assembling and fastening components
		3.2	Assemble components to specifications
		3.3	Remove waste materials in accordance with work practices and relevant legislation
		3.4	Sand surface area of assembled components for installation, where applicable
		3.5	Pre-coat component surface for preservation according to standard specifications and procedures, where applicable
4	**Install components**	4.1	Mark surface area for layout installation, where applicable
		4.2	Apply fitting and levelling practices
		4.3	Select fastenings to suit job requirements
		4.4	Fix components to meet specified job requirements
		4.5	Apply clean work practices for coating and adhesive applications

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:

- timber
- composites
- fibre-reinforced plastics
- acrylics
- polycarbonates
- glass
- metal

Components include one (1) or more of the following:

- flooring/decking, partitions
- door frames
- portlights
- hatches
- windows
- windscreens
- non-structural bulkheads
- deckheads
- bunks
- cupboards and other furniture
- lining
- engine room and galley

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25010 Perform fitout procedures (Release 1).

Release 1. Supersedes and is equivalent to MEM25010B Perform fitout procedures.

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Links

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Assessment Requirements for MEM25010 Perform fitout procedures

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25010 Perform fitout procedures (Release 1).

Release 1. Supersedes and is equivalent to MEM25010B Perform fitout procedures.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans and drawings to perform fitout procedures
- identifying job fixing methods, fitout components, scantling sizes, patterns and materials from fitout plans and procedures
- identifying component structure, materials and assembly procedure and determining quantities and producing cutting list
- marking out materials and selecting and using appropriate tools/equipment/machinery to produce the desired shape and appearance
- assembling, fitting, adjusting and fixing equipment and components and checking assemblies against specifications for correct sizing and construction standard
- sanding surface area of component parts and treating surface areas for preservation and testing for watertight integrity
- preparing fitout structures for coating and adhesive applications and fixing components to meet job specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures used for drawing identification and accuracy
- common structures used in boat fitout
- job fixing methods, fitout components, materials and use of patterns
- procedures used for constructing and assembling component
- typical sizing, common species, strength and appearance requirements
- practice used for machining of material

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- material characteristics in terms of species, strength, appearance and grade
- marking and cutting procedures
- practices used in identification and assembly sequence
- assembly and fastening methods
- surface preservation pre-coating and application method
- practices used for fitting and levelling
- types of fastenings and methods of fixing/fastening applications and material species
- watertight integrity testing methods and their application
- waste disposal obligations and regulations.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing fitout procedures at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25011 Install marine systems

Modification History

Release 1. Supersedes and is equivalent to MEM25011B Install marine systems

Application

This unit of competency defines the skills and knowledge required to install and test engine/plant and ancillary equipment relevant to propulsion, stability, steering and fuel systems for mechanically powered marine vessels and application can apply to drive systems, including inboard/outboard, water jet and side thrusting units (excluding outboard motor installation).

Site locations can include new or existing external and internal locations for foundations, footings, beds and frameworks completed prior to installation and commissioning and tasks can be undertaken in a workshop/site, moored or in a sea-trial situation.

Where technical drawings are required to be interpreted unit MEM09002 Interpret technical drawing should also be selected.

Where load shifting equipment is required to be used unit MEM11010 Operate mobile load shifting equipment should also be selected.

Where moveable and fixed load shifting equipment is required to be used unit MEM11022 Operate fixed/moveable load shifting equipment should also be selected.

Where installation only is required unit MEM25015 Assemble and install equipment and accessories/ancillaries should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM11011	Undertake manual handling

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MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Prepare installation site**	2.1	Check site features using appropriate measuring equipment
		2.2	Report non-compliance with specification to appropriate authority
		2.3	Undertake modifications with approval of appropriate authority
		2.4	Prepare installation site and components
3	**Install marine engines/plant**	3.1	Carry out all work in accordance with site procedures and relevant Australian Standards
		3.2	Prepare engine/plant components and ancillary equipment for correct sequential installation

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.3	Install engine/plant in accordance with manufacturer's site specifications
		3.4	Check engine/plant for conformance to specifications, and undertake modifications/adjustments according to procedures
		3.5	Install engine/plant in accordance with specifications
		3.6	Finalise site conditions in accordance with WHS requirements and SOPs
		3.7	Complete documentation to required specifications
4	**Test engine/plant systems and ancillary equipment**	4.1	Identify work/test requirements for engine/plant and ancillary equipment
		4.2	Test engine/plant and ancillary equipment for correct operation using instruments appropriate to the testing task
		4.3	Assess and verify operational function
5	**Collect data and localise fault conditions**	5.1	Use drawings/diagrams and operational specifications to identify and localise fault conditions
		5.2	Examine built-in fault indicators and error codes, and interpret and record results
		5.3	Localise fault condition to major component level
6	**Analyse and report test results**	6.1	Analyse/verify test results against operational specifications and confirm localised faults
		6.2	Report potential and actual faults according to SOPs
		6.3	Plan corrective action and record/document action plan

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Marine systems include the following:

- engines
- stabilisers
- steering systems
- fuel systems

Stabilisers are fin and/or tab types and include one (1) or more of the following:

- electric
- hydraulic
- mechanical

Steering system units include one (1) or more of the following:

- hydraulic
- cable
- wire-operated

Fuel systems include one (1) or more of the following:

- petrol
- diesel supply operations

Instruments include one (1) or more of the following:

- mechanical
- pneumatic/electro-pneumatic
- electronic (analog/digital)
- associated instruments that measure variables, including:
  - temperature
  - pressure
  - flow rate
  - levels
  - lights
  - density
  - any other operational variable

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25011B Install marine systems

Links

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Assessment Requirements for MEM25011 Install marine systems

Modification History

Release 1. Supersedes and is equivalent to MEM25011B Install marine systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, supporting documentation and Australian Standards to install marine systems
- checking and preparing site for correct location, dimensions and levels and preparing surfaces, materials and components for installation
- installing engine/plant components and ancillary equipment in accordance with procedures and manufacturer's specifications
- levelling, aligning, coupling and connecting engine/plant (excluding electrical connections) in accordance with procedures and manufacturer specifications
- testing engine/plant and ancillary equipment for correct operation using appropriate test equipment
- interpreting operational data of engine/plant and ancillary equipment, faults from built-in fault indicators and error codes and localising fault condition to major component level
- analysing test results against specifications for faults and planning remedial action and recording/documenting action plan.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- equipment used to check various site features and their use
- marine systems, specifications, applications and non-compliance procedures
- relevant codes and standards
- fixing/fastening methods components
- levelling, alignment, coupling and connection requirements
- relevant person(s) for making electrical connections
- cleaning and clearing requirements
- waste disposal obligations and regulations
- reporting and recording requirements

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- operational requirements/specifications of engine/plant and ancillary equipment and testing procedures and principles
- normal operating characteristics of engine/plant and ancillary equipment
- faults and malfunctions and error indications in built-in devices
- methods of determining fault condition and procedures for reporting faults
- causes/faults in engine/plant and ancillary equipment
- procedures for recording/documenting corrective maintenance activity.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing marine systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25012 Install and test operations of marine auxiliary systems

Modification History

Release 1. Supersedes and is equivalent to MEM25012B Install and test operations of marine auxiliary systems

Application

This unit of competency defines the skills and knowledge required to install and test marine auxiliary systems.

Site locations can include external and internal locations for foundations, footings, beds and frameworks completed prior to installation and commissioning and tasks can be undertaken in a workshop/site, moored or in a sea-trial situation.

Where installation only is required unit MEM25015 Assemble and install equipment and accessories/ancillaries should be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13003	Work safely with industrial chemicals and materials
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Select auxiliary system**	2.1	Identify installation and compatibility of surface and fitting materials
		2.2	Identify installation site of system
		2.3	Select auxiliary system in accordance with job requirements
		2.4	Identify material structure and installation procedures
		2.5	Identify and verify associated installation/assembly plans/instruction
3	**Install auxiliary system**	3.1	Select appropriate tools for specified installation
		3.2	Cut structural area to suit installation requirements, where applicable
		3.3	Fit structural reinforcement to suit job requirement, where applicable
		3.4	Prepare structural area for surface preparation
		3.5	Apply coating sealants and/or isolation materials to suit job requirements
		3.6	Apply fastening methods

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		3.7 Apply installation procedures in accordance with job specification
		3.8 Apply clean work practices
4	**Test operation of auxiliary system**	4.1 Apply pre-test checks and verify before standard testing procedures are actioned
		4.2 Identify and verify test operation procedures
		4.3 Set up and use test equipment in accordance with testing practice
		4.4 Test system in accordance with specified operational procedures
		4.5 Record/report faults to appropriate authorities
		4.6 Rectify faults and re-test for correct operation
		4.7 Record and document final test operation according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• metals • timber • resin and glass reinforcements

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Auxiliary systems include one (1) or more of the following:	• bilge • freshwater • fire (water) • sanitary plumbing systems • lifting systems, including davits, crane and winch units

Test equipment includes one (1) or more of the following:	• mechanical
	• pneumatic/electro-pneumatic
	• electronic (analog/digital)
	• associated instruments that measure variables, including:
	  • temperature
	  • pressure
	  • flow rate
	  • levels
	  • lights
	  • density
	  • any other operational variable

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25012B Install and test operations of marine auxiliary systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25012 Install and test operations of marine auxiliary systems

Modification History

Release 1. Supersedes and is equivalent to MEM25012B Install and test operations of marine auxiliary systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans and supporting documentation to install and test operations of marine auxiliary systems
- identifying materials for installation from plans/drawings and establish compatibility of component material and structural surface
- selecting and installing auxiliary systems using appropriate tools, equipment and procedures
- selecting and applying sealants and coatings/isolation materials, including sikaflex, paints, flowcoat and nylon to suit job requirements
- modifying structural components without compromising structural and watertight integrity and assembling and installing systems utilising appropriate fastening methods in accordance with plans and specifications
- testing system using appropriate testing equipment to verify correct system operation
- recording/reporting and rectifying all faults and re-testing to ensure correct operation.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- role of plans/specification used for installation of identified components
- species/types of materials and their uses
- compatibility of species/types of construction materials of component and surface
- material species/types of structure/system and installation process
- plans/instruction relevant to installation and assembly of selected system
- tools associated with system installation and their uses
- effects of sea-going stresses on structure and components
- practices used in modifying structural components to suit system applications

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- procedures for applying the reinforcement to structural section
- method of sanding for surface preparation
- sealant coatings and/or isolation materials
- waste disposal obligations and regulations
- standard pre-testing checks and role, function and set-up procedure of test equipment
- practice used in testing operation of installed system
- recording procedures for fault diagnosis and identification
- methods used for rectifying faults and re-testing of system operations
- test operation checklist and recording procedure for final test clearance.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing and testing operations of marine auxiliary systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25013 Produce three-dimensional plugs/moulds

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25013 Produce three-dimensional plugs/moulds (Release 1).

Release 1. Supersedes and is equivalent to MEM25013B Produce three-dimensional plugs/moulds.

Application

This unit of competency defines the skills and knowledge required to manufacture three-dimensional plugs and, where applicable, solid and/or split moulds constructions used in marine vessel construction.

Tasks can include the use of hand and mechanical lay-up practices for plug/mould construction.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band:

This unit has dual status and is to be regarded as both a Specialisation Band A unit and Specialisation Band B unit for progression to C7 (AQF level IV).

Unit Weight: **12**

Pre-requisite Unit

MEM04018	Perform general woodworking machine operations
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12007	Mark off/out structural fabrications and shapes
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM25002	Form and integrate fibre-reinforced structures
MEM25003	Set up marine vessel structures

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Establish plug specifications from drawings, relevant documentation and client discussion, as appropriate
2	**Construct plug**	2.1	Select plug construction materials in accordance with job requirements and specifications
		2.2	Select plug coating materials to meet specifications in accordance with organisational procedures
		2.3	Select appropriate tooling and machinery
		2.4	Mark out plug material/s in accordance with plug construction requirements
		2.5	Carry out plug release angles/taper, flanges and rounding/concaving of corners, where applicable

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.6	Use appropriate tools, machines and construction practices to construct plug
3	**Finish plug**	3.1	Check plug for compliance with specifications/drawing
		3.2	Apply final finish coatings to plug to comply with specifications, where required
		3.3	Prepare plug for mould manufacturing in accordance with specifications or procedures
4	**Determine mould requirements**	4.1	Interpret mould construction specifications and drawings
		4.2	Select mould construction materials in accordance with specifications
		4.3	Select appropriate tools and machinery/equipment for job application
5	**Produce mould**	5.1	Apply tooling coat to plug in accordance with standard application procedures
		5.2	Apply construction materials to plug in accordance with appropriate lay-up sequence and procedure
		5.3	Apply stiffening/bracing materials in accordance with job requirements, where applicable
		5.4	Prepare mould for production run/s, where applicable

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:

- timber
- metal
- plastic fibreglass
- composites
- fillers

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM25013 Produce three-dimensional plugs/moulds (Release 1).

Release 1. Supersedes and is equivalent to MEM25013B Produce three-dimensional plugs/moulds.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25013 Produce three-dimensional plugs/moulds

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM25013 Produce three-dimensional plugs/moulds (Release 1).

Release 1. Supersedes and is equivalent to MEM25013B Produce three-dimensional plugs/moulds.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans and drawings to identify materials for producing three-dimensional plugs/moulds
- marking out dimensions on appropriate materials relevant to plug/mould components and selecting and using appropriate hand tools, hand held power tools and workshop machinery to suit construction
- constructing plugs/moulds and modifying, as required, to ensure compliance with specifications/drawings
- checking external/internal dimensions against specifications/drawings and applying final finish coatings in accordance with procedures
- preparing plug/mould for production run by fitting reinforcement components and or materials in accordance with job requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- plug/mould construction materials, characteristics and applications
- plug/mould coating materials, characteristics and applications, including tooling coats
- correct dimensions and application procedures for marking out
- release angles/tapers, flanges and rounding/concaving of corner sections
- hand tools/hand held power tools and workshop machinery and their uses
- plug/mould construction methods
- methods used to apply stiffening/bracing/reinforcement
- method of application and sequence of final finish coating

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- procedures for sanding/buffing/polishing plug/mould
- fault identification and rectification
- waste removal and disposal procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in producing three-dimensional plugs/moulds at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM25014 Perform marine slipping operations

Modification History

Release 1. Supersedes and is equivalent to MEM25014B Perform marine slipping operations

Application

This unit of competency defines the skills and knowledge required to perform slipping operations on marine vessels, including work/pleasure craft and yachts appropriate to the capacity of the slipping facility.

Where travel lifts, forklifts and/or cranes are required to be used unit MEM11010 Operate mobile load shifting equipment or other appropriate units should also be selected.

Where boat is to be moored using the vessel's engine or with the assistance of a work boat unit MEM50009 Safely operate a mechanically powered recreational boat should be selected.

Where skills for drawing interpretation, marking out and constructing structures for slipping are required appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine set-up of slipping facility to suit vessel in accordance with organisational and legislative requirements
2	**Set up slipping facilities**	2.1	Take measurements to suit hull structure, where applicable
		2.2	Position hull support bearers to suit hull structure, where applicable
3	**Perform hauling out procedures**	3.1	Position slipping facilities to suit slipping application
		3.2	Position vessel to suit slipping set-up
		3.3	Select vessel retaining ropes and secure in accordance with slipping facility and vessel retaining requirements
		3.4	Ground/level vessel for positioning of hull support
		3.5	Position hull support mechanics
		3.6	Carry out safety checks of vessel stability
4	**Perform launching procedures**	4.1	Check vessel support and slip devices for safety
		4.2	Apply pre-launch safety checks for vessel seaworthiness
		4.3	Carry out launch practices according to standard procedure and organisational requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.4 Re-position hull support devices to prevent obstruction during vessel removal
	4.5 Moor vessel using appropriate restraints, where applicable

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Vessel support and slip devices include one (1) or more of the following:	• slings • shoring • cables • stays • blocks • chocks

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25014B Perform marine slipping operations

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25014 Perform marine slipping operations

Modification History

Release 1. Supersedes and is equivalent to MEM25014B Perform marine slipping operations

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans and drawings to identify measurements relevant to positioning of hull structure on slipping facilities
- setting up slipping facilities to accommodate vessel and positioning relevant support bearer/blocks and arms according to design, dimensions, shape and weight
- operating slip and slipping machinery and manoeuvring vessel in accordance with the set-up of slipping facility and securing vessel in preparation for slipping
- inspecting vessel when slipped to ensure adequacy of hull support and adjusting and fixing support mechanisms, as required
- cleaning site and preparing vessel for launching, including performing safety checks to ensure vessel stability and watertight integrity
- positioning hull supports, including arms and slings to allow clear passage for removal of vessel, and mooring vessel in accordance with requirements of the mooring facility.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- types of slipways and operational procedures
- interpretation of ships/boats drawings, slipping specifications or instructions
- safety and legislative requirements for slipping and launching vessels
- different types of hull structures, dimensions, vessel weights and appropriate slipping arrangements
- methods of supporting/securing vessel ready for slipping
- methods of supporting hull during and after slipping
- procedures for operating slipway and slipway machinery
- procedures for positioning slip and manoeuvring vessels
- techniques for trimming and final securing of slipped vessel and disengaging slipway machinery

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- knots, lashings and their applications
- pre-launch preparation requirements and safety checks to be performed
- checks to ensure stability and watertight integrity
- procedures used in launching vessels and mooring methods
- procedures for recovering and securing slip.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing marine slipping operations at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM25015 Assemble and install equipment and accessories/ancillaries

Modification History

Release 1. Supersedes and is equivalent to MEM25015A Assemble and install equipment and accessories/ancillaries

Application

This unit of competency defines the skills and knowledge required to assemble and install equipment and ancillaries/accessories.

Work is undertaken using new external and internal locations and sites and foundations, footings, beds and framework are completed prior to installation practices.

It does not cover installation requiring substantial modification to the existing site or where components are replaced by the same or similar type.

Where production-related assembly work is undertaken unit MEM03002 Perform precision assembly should also be selected.

Where installation requires substantial modification to the existing site, and is being replaced by the same or similar type unit MEM10006 Install machine/plant should also be selected.

Where load shifting equipment is required to be used unit MEM11010 Operate mobile load shifting equipment should also be selected.

Where positions are determined, alignments are undertaken and testing within manufacturer specifications is required unit MEM25012 Install and test operations of marine auxiliary systems should also be selected.

This unit should not be selected if unit MEM03002 Perform precision assembly has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

Competency Field

Marine craft construction

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Inspect and prepare the installation site**	2.1	Check site for location, dimension and levels using appropriate measuring equipment
		2.2	Report non-compliance with specification to appropriate authority
		2.3	Undertake alteration and correction with approval of

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		appropriate authority
		2.4 Prepare all surfaces, materials and components for use
3	**Install machinery/ plant and equipment**	3.1 Carry out work in accordance with site procedures and legislative requirements
		3.2 Prepare machine/equipment components for correct sequential installation
		3.3 Install machinery/plant or equipment in accordance with manufacturer and site specifications
		3.4 Undertake routine modification/alterations to operating procedures, where required
		3.5 Level, align, connect machine/equipment or couple, where required (excluding electrical connections)
		3.6 Clean site and clear all debris and leave in safe state

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Machine/equipment components include one (1) or more of the following:	• toe rails • cleats • bollards • bow-rollers • fairleads • stanchions

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- railings
- non-powered and powered winches
- engines and driving mechanisms
- auxiliary power plants
- desalinating units
- stabiliser units
- powered/non-powered davits
- pumps
- compressors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM25015A Assemble and install equipment and accessories/ancillaries

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM25015 Assemble and install equipment and accessories/ancillaries

Modification History

Release 1. Supersedes and is equivalent to MEM25015A Assemble and install equipment and accessories/ancillaries

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, plans, drawings, charts, lists and other applicable reference documents to assemble and install equipment and accessories/ancillaries
- checking site and taking dimensions and measurements and performing alterations and corrections with approval of appropriate authority
- preparing surfaces, materials and components for use and checking components against specifications for compliance
- preparing machine/equipment components for correct sequential installation
- undertaking numerical operations and calculations associated with assembling and installing equipment and accessories/ancillaries
- installing machine/plant or equipment and performing modifications/alterations as required in accordance with manufacturer and site specifications
- levelling, aligning, connecting and coupling machine/equipment to specifications and packing/sealing through-hull fittings, as required.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- appropriate levelling and measuring equipment and benefits of choice
- procedural standards, legislative requirements and non-compliance, and the impact of such
- preparatory requirements and processes
- sequence of installation of parts and installation procedures
- reasons for modifications/alterations and impact of modifications/alterations
- procedures for levelling and aligning and impacts of misalignment
- cleaning procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in assembling and installing equipment and accessories/ancillaries at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM26001 Lay up composites using open moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26001A Lay up composites using open moulding techniques

Application

This unit of competency defines the skills and knowledge required to fabricate composites using open moulding techniques.

This unit is one of three units covering the basic composite fabrication techniques, the other two being unit MEM26002 Lay up composites using vacuum closed moulding techniques and unit MEM26003 Lay up composites using pressure closed moulding techniques, which together are intended to ensure the composite tradesperson can undertake a basic fabrication using these methods.

Where mechanically assisted movement of large parts is required, appropriate units should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify product requirements from specifications, job sheets or work instructions and customer requests
		1.5	Select open moulding technique most appropriate to product requirements
		1.6	Identify or develop required procedures to make product using selected process
2	**Set up equipment/ workplace and prepare materials**	2.1	Select required items of equipment and ancillary equipment
		2.2	Prepare and assemble all equipment and ancillary equipment as required by procedures
		2.3	Identify required reinforcing/reinforcing system and determine quantity of reinforcing
		2.4	Prepare reinforcing including cutting to size/shape and carry out any pre-treatment, as required
		2.5	Identify required resin system
		2.6	Determine quantity of resin components and confirm adequate quantities are available
		2.7	Mix resin with minimised waste and test resin
3	**Fabricate and adjust equipment and materials, as required**	3.1	Identify and control hazards
		3.2	Apply gel coat, resin and reinforcing in accordance with procedures
		3.3	Ensure required resin distribution

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		3.4 Cure product and remove product from mould when ready
		3.5 Identify typical problems and take appropriate remedial action
		3.6 Perform final verification to meet product requirements
4	**Clean up and maintain equipment**	4.1 Clean all moulding and mixing equipment
		4.2 Undertake minor maintenance, as appropriate
		4.3 Prepare for next use or storage
		4.4 Inspect equipment for faults and take appropriate corrective action
		4.5 Store equipment
		4.6 Minimise and dispose of waste as appropriate
		4.7 Complete required logs and reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Open moulding	• hand lay-up

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

techniques include one (1) or more of the following:	• chopper gun • filament winding
Equipment includes the following:	• moulds and mould components • resin application and dispersion tools
Typical problems include one (1) or more of the following:	• contamination • air entrapment • resin rich • uneven distribution of resin • difficult mould shapes • resin curing too quickly • resin curing too slowly • failure to release

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26001A Lay up composites using open moulding techniques

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26001 Lay up composites using open moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26001A Lay up composites using open moulding techniques

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets and customer requests for laying up composites using open moulding techniques
- calculating the quantity of materials required and applying gel coat and resin using rollers, brushes and/or chopper gun in accordance with procedures
- identifying and preparing reinforcement/reinforcement system
- assembling, cleaning and preparing simple and complex moulds and applying wax to release systems
- removing product from simple and complex moulds using appropriate equipment
- ensuring compliance to specifications
- identifying and rectifying any typical problems and monitoring curing cycles
- undertaking minor maintenance to chopper guns and/or pump systems (reciprocating airless pumps with air support in accordance with procedures
- minimising wastage
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- preparation schedules, terminology and information relevant to standard work instructions
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to laying up composites using open moulding techniques
- release agents surface tension
- gel coat, resin types and applications
- types of reinforcement and lay-up techniques

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- common tools/equipment and their maintenance
- operation and maintenance requirements for solvent cleaners (filters)
- correct laminating techniques and finishing off (e.g. detail consolidation/rolling, check consistency and evenness of resin/glass, remove air entrapment and check with light)
- managing post-cure requirements (e.g. air cure and oven cure)
- production environment variables including the effect of humidity (e.g. epoxy backbone), temperature, ultraviolet (UV) light and contamination from other processes
- managing hazardous environments (e.g. styrene levels)
- function of catalysts, accelerators and promoters
- control of overspray
- storage of moulds
- waste disposal.

Assessment Conditions

- Assessors must:
  - have vocational competency in laying up composites using open moulding techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26002 Lay up composites using vacuum closed moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26002A Lay up composites using vacuum closed moulding techniques

Application

This unit of competency defines the skills and knowledge required to fabricate composites using vacuum infusion processing (VIP) or other vacuum closed moulding techniques.

This unit is one of three units covering the basic composite fabrication techniques, the other two being unit MEM26001 Lay up composites using open moulding techniques and unit MEM26003 Lay up composites using pressure closed moulding techniques, which together are intended to ensure the composite tradesperson can undertake a basic fabrication using these methods.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify product requirements from specifications, job sheets or work instructions and customer requests
		1.5	Select vacuum closed mould technique most appropriate to product requirements
		1.6	Identify or develop required procedures to make product using selected process
2	**Set up mould equipment and prepare materials**	2.1	Select required items of equipment and ancillary equipment
		2.2	Prepare and assemble all equipment and ancillary equipment as required by procedures
		2.3	Pack mould according to procedures/laminate schedule
		2.4	Identify required reinforcing/reinforcing system and determine quantity of reinforcing
		2.5	Prepare reinforcing, including cutting to size/shape, and carry out any pre-treatment, as required
		2.6	Identify required resin system
		2.7	Determine quantity of resin components and confirm adequate quantities are available
		2.8	Mix resin with minimised waste and test resin
3	**Fabricate and adjust equipment and materials, as required**	3.1	Identify and control hazards
		3.2	Apply gel coat and introduce resin to mould
		3.3	Ensure air is vented
		3.4	Ensure required resin distribution

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.5	Cure product and remove product from mould when ready
		3.6	Identify typical problems and take appropriate remedial action
		3.7	Perform final verification to meet product requirements
4	**Clean up and maintain tools and equipment**	4.1	Clean all moulding and mixing equipment
		4.2	Undertake minor maintenance, as appropriate
		4.3	Prepare for next use or storage
		4.4	Inspect equipment and take appropriate action
		4.5	Store equipment
		4.6	Minimise waste and dispose of waste, as appropriate
		4.7	Complete required logs and reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Closed moulding techniques include one (1) or more of the following:	• resin infusion under flexible tooling (RIFT) • vacuum bagging

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mould equipment includes the following:	• airlines • catchpots • moulds and mould components • infusion system for laminate
Typical problems include one (1) or more of the following:	• dead spots trapping air • resin curing too quickly • resin curing too slowly

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26002A Lay up composites using vacuum closed moulding techniques

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26002 Lay up composites using vacuum closed moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26002A Lay up composites using vacuum closed moulding techniques

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, customer requests for laying up composites using vacuum closed moulding techniques
- selecting appropriate closed moulding techniques in accordance with specifications and procedures
- introducing resin infusion into mould by applying the following:
  - tack tape
  - bag (pleats and sits well)
  - inlet and outlet plumbing (connect/disconnect)
  - managing flow medium (e.g. cloth), cores, flow and gel times (relationship to positioning and spacing of lines)
  - managing and monitoring vacuum pressure
  - monitoring cure cycles
  - checking for leaks
- performing vacuum bagging by applying the following:
  - resin infusion data and protect bag from contamination
  - breather cloth/films
  - peel ply and achieving correct ply location and orientation
- identifying and rectifying any typical problems and monitoring curing cycles
- undertaking minor maintenance to equipment and ancillary equipment in accordance with procedures
- minimising wastage
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using vacuum closed moulding techniques
- reinforcement and lay-up schedules (e.g. layers of reinforcement, direction and darts)
- release systems and processes
- tool sealing
- gel coating, times and working times
- sealing of mould (use of tack tape (e.g. butyl (or other) mastic and mechanical seals and clamps)
- vacuum and vacuum systems, adjustment and measurement, and vacuum control (e.g. switches, controls and regulators)
- resin systems applicable to process (e.g. vacuum infusion or vacuum bagging – polyester and epoxy)
- initiator/catalyst or hardener rates to temperature (hot/cold)
- free amine/amine blushes
- heat curing requirements and how it is done (e.g. ovens, hot bonders (blankets), and autoclaves) and heat curves
- TG (glass transition temperature)
- design briefs (e.g. tool design and part lines)
- Darcy's Law and its application to the flow of resins through porous media (e.g. reinforcing and cores).

Assessment Conditions

- Assessors must:
  - have vocational competency in laying up composites using vacuum closed moulding techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications

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- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM26003 Lay up composites using pressure closed moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26003A Lay up composites using pressure closed moulding techniques

Application

This unit of competency defines the skills and knowledge required to fabricate composites using a resin transfer moulding (RTM – resin under pressure) or other pressure closed mould techniques.

This unit is one of three units covering the basic composite fabrication techniques, the other two being unit MEM26001 Lay up composites using open moulding techniques and unit MEM26002 Lay up composites using vacuum closed moulding techniques, which together are intended to ensure the composite tradesperson can undertake a basic fabrication using these methods.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify product requirements from specifications, job sheets or work instructions and customer requests
		1.5	Select pressure closed mould technique most appropriate to product requirements
		1.6	Identify or develop required procedures to make product using selected process
2	**Set up mould equipment and prepare materials**	2.1	Select required items of equipment and ancillary equipment
		2.2	Prepare and assemble all equipment and ancillary equipment as required by procedures
		2.3	Pack mould according to procedures/laminate schedule
		2.4	Identify required reinforcing/reinforcing system and determine quantity of reinforcing
		2.5	Prepare reinforcing, including cutting to size/shape and carry out any pre-treatment, as required
		2.6	Identify required resin system
		2.7	Determine quantity of resin components and confirm adequate quantities are available
		2.8	Mix resin with minimised waste and test resin
3	**Fabricate and adjust equipment and materials, as required**	3.1	Identify and control hazards
		3.2	Apply gel coat and introduce resin to mould
		3.3	Ensure air is vented, as required

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Ensure required resin distribution
		3.5	Cure product and remove product from mould when ready
		3.6	Identify typical problems and take appropriate remedial action
		3.7	Perform final verification to meet product requirements
4	**Clean up and maintain tools and equipment**	4.1	Clean all moulding and mixing equipment
		4.2	Undertake minor maintenance, as appropriate
		4.3	Prepare for next use or storage
		4.4	Inspect equipment and take appropriate action
		4.5	Store equipment
		4.6	Minimise waste and dispose of waste, as appropriate
		4.7	Complete required logs and reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Closed moulding techniques include one	• RTM • compression moulding

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

(1) or more of the following:	
Mould equipment includes the following:	• moulds and mould components • infusion system for laminate
Typical problems include one (1) or more of the following:	• dead spots trapping air • resin curing too quickly • resin curing too slowly

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26003A Lay up composites using pressure closed moulding techniques

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26003 Lay up composites using pressure closed moulding techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26003A Lay up composites using pressure closed moulding techniques

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, customer requests for laying up composites using pressure closed moulding techniques
- applying gel coats/surface finishes in accordance with procedures
- selecting and using catalyst systems for different resins and techniques
- achieving correct ply location and orientation and applying mastic tape and sealing bag for resin infusion and checking bag for leaks
- connecting resin plumbing – inlet/outlet points
- accessing and operating appropriate computer programs
- identifying and rectifying any typical problems and monitoring curing cycles
- undertaking minor maintenance to equipment and ancillary equipment in accordance with procedures
- minimising wastage
- completing all documentation and reports including items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using pressure closed moulding techniques
- reinforcement and lay-up schedules (e.g. layers of reinforcement, direction and darts)
- release systems
- gel coating, times and working times
- sealing of mould
- tool sealing

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- resin systems applicable to process (polyester and epoxy)
- pressure systems and process monitoring
- initiator/catalyst or hardener rates to temperature (hot/cold)
- free amine/amine blushes
- heat curing requirements and how it is done (e.g. ovens, hot bonders (blankets), and autoclaves) and heat curves
- TG (glass transition temperature)
- design briefs (e.g. tool design and part lines)
- Darcy's Law and its application to the flow of resins through porous media (e.g. reinforcing and cores).

Assessment Conditions

- Assessors must:
  - have vocational competency in laying up composites using pressure closed moulding techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26004 Make basic plugs for composites fabrication

Modification History

Release 1. Supersedes and is equivalent to MEM26004A Make basic plugs for composites fabrication

Application

This unit of competency defines the skills and knowledge required to make basic plugs for routine or one-off production.

This unit does not cover the making of the plugs which require specialist patternmaking trade skills. See the relevant metals and engineering units of competency for these situations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine product**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements		requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify product requirements from specifications, job sheets or work instructions and customer requests
2	**Interpret product requirements**	2.1	Determine features of plug required, including relief, parting lines and efficient lay-up
		2.2	Identify or develop procedure to make plug
		2.3	Select tooling and materials required to make plug
		2.4	Liaise with mould maker and determine plug features in relation to suitable plug, including release angles and parting lines
		2.5	Set up equipment/workplace
3	**Prepare materials**	3.1	Calculate surface area and required resin volume
		3.2	Develop cutting list for solid materials
		3.3	Mark out and cut out sheet materials, as required
		3.4	Calculate resin content
		3.5	Develop batch scale formulae for resin system
		3.6	Prepare non-composite materials to be used
		3.7	Measure resin components and minimise waste, as appropriate
4	**Make plug**	4.1	Identify and control hazards
		4.2	Mix resin system
		4.3	Fabricate and detail plug, including buff, fill and get ready for production
		4.4	Identify routine and non-routine faults and take appropriate remedial action

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		4.5	Perform final verification to meet product requirements
5	**Clean up and maintain equipment**	5.1	Label and store plug for future use
		5.2	Clean and replace tools ready for next use
		5.3	Undertake any required minor maintenance of tools/equipment
		5.4	Complete required logs and reports according to SOPs
6	**Identify common problems**	6.1	Recognise typical process and product problem/potential problem and take appropriate action

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine faults include one (1) or more of the following:

- gel coat sag
- slow curing rates
- blistering
- wrinkles
- pinholes
- brush marks
- poor surface finish

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Non-routine faults include one (1) or more of the following:	• release agents failure • mould release failure • warping or cracking after moulding
Typical process and product problems include one (1) or more of the following:	• structural strength, rigidity and stability of the tooling • dimensional accuracy of the tooling • allowances in the design for shrinkage, deformations and alterations in the process from tooling to mould to finished composite product • placement of flanges, closures, fitments, supports, struts and stiffeners • variations in materials and/or contamination of materials

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26004A Make basic plugs for composites fabrication

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26004 Make basic plugs for composites fabrication

Modification History

Release 1. Supersedes and is equivalent to MEM26004A Make basic plugs for composites fabrication

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, product drawings, customer requests, industry codes of practice and government regulations for making basic plugs for composites fabrication
- liaising with mould maker to determine plug features
- calculating surface area, required resin volume and resin content
- making plugs as required in accordance with procedures
- identifying faults both routine and potential and applying remedial action
- undertaking minor maintenance to tools and equipment in accordance with procedures
- minimising wastage
- labelling and storing plug
- cleaning and replacing tools for next use
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- finishing resins
- tooling materials and resins
- methods used to calculate surface area, required resin volume and resin content
- batch scale formulae for resin system
- parting lines
- design criteria/brief
- reverse engineering
- shrinkage

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- cure values
- correct release agent
- thermal expansion
- open/closed mould (e.g. flange width and draft)
- resin transfer moulding (RTM) – metal versus composite mould
- closed mould (e.g. A/B side, bag it and silicon blanket)
- corners and undercuts.

Assessment Conditions

- Assessors must:
  - have vocational competency in making basic plugs for composites fabrication at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM26005 Make basic moulds for composites fabrication

Modification History

Release 1. Supersedes and is equivalent to MEM26005A Make basic moulds for composites fabrication

Application

This unit of competency defines the skills and knowledge required to make low pressure moulds for composites for routine or one-off production.

This unit does not cover the making of the moulds which require specialist patternmaking or metal fabrication trade skills. See the relevant metals and engineering units of competency for these situations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **3**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	product requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify product requirements from specifications, job sheets or work instructions and customer requests
2	**Interpret product requirements**	2.1	Determine features of mould including relief, parting lines and efficient lay-up
		2.2	Identify or develop procedure to make mould
		2.3	Select tooling and materials required to make mould
		2.4	Liaise with plug maker in relation to suitable plug
		2.5	Set up equipment/workplace
3	**Prepare materials**	3.1	Calculate surface area and required resin volume
		3.2	Develop cutting list for solid materials
		3.3	Mark out and cut out sheet materials, as required
		3.4	Calculate resin content
		3.5	Develop batch scale formulae for resin system
		3.6	Prepare any non-composite materials to be used
		3.7	Measure resin components and minimise wastes, as appropriate
4	**Make mould**	4.1	Identify and control hazards
		4.2	Check suitability of plug, including release angles and parting lines
		4.3	Prepare plug, including cleaning, repairing surface blemishes and applying release systems
		4.4	Mix resin system

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.5 Fabricate mould and release mould from plug
	4.6 Detail mould, including buffing, filling and getting ready for production
	4.7 Identify routine and non-routine faults and take appropriate remedial action
	4.8 Recognise typical process and product problem/potential problem and take appropriate action
	4.9 Perform final verification to meet product requirements
5 **Clean up and maintain equipment and anticipate common problems**	5.1 Label and store mould for future use
	5.2 Clean and replace tools ready for next use
	5.3 Undertake any required minor maintenance of tools/equipment
	5.4 Complete required logs and reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Routine faults include one (1) or more of the following:	• gel coat sag • slow curing rates • blistering • wrinkles

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

	• pinholes • brush marks • poor surface finish
Non-routine faults include one (1) or more of the following:	• release agents failure • mould release failure • warping or cracking after moulding
Typical process and product problems include one (1) or more of the following:	• structural strength, rigidity and stability of the tooling • dimensional accuracy of the tooling • allowances in the design for shrinkage, deformations and alterations in the process from tooling to mould to finished composite product • placement of flanges, closures, fitments, supports, struts and stiffeners • variations in materials and/or contamination of materials

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26005A Make basic moulds for composites fabrication

Links

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Assessment Requirements for MEM26005 Make basic moulds for composites fabrication

Modification History

Release 1. Supersedes and is equivalent to MEM26005A Make basic moulds for composites fabrication

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, product drawings, customer requests for making basic moulds for composites fabrication
- developing templates for hand moulds as required in accordance with procedures
- fabricating the mould, releasing the mould from plug and detailing the mould
- identifying faults both routine and potential and applying remedial action
- undertaking minor maintenance to tools and equipment in accordance with procedures
- minimising wastage
- completing all documentation and reports, including items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to making basic moulds for composites fabrication
- finishing resins
- tooling materials and resins
- parting lines
- design criteria/brief
- reverse engineering
- shrinkage
- cure values
- correct release agent
- thermal expansion
- open/closed mould (e.g. flange width and draft)

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- resin transfer moulding (RTM) – metal versus composite mould
- closed mould (e.g. A/B side, bag it and silicon blanket)
- corners and undercuts.

Assessment Conditions

- Assessors must:
  - have vocational competency in making basic moulds for composites fabrication at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26006 Mark and cut out sheets for composite use

Modification History

Release 1. Supersedes and is equivalent to MEM26006A Mark and cut sheets for composite use

Application

This unit of competency defines the skills and knowledge required to mark and cut out sheets for composite use.

The marking out/cutting out of sheets used for composites can be significantly different to the marking out/cutting out of other materials, including metals. Sheets used in composite fabrication often have significant directionality which must be considered and as a result of this composite design often includes different physical properties in one direction to another and so sheets must be marked and cut to align the required directional properties of the product with those of the sheets used in the fabrication.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

Where the selection and use of power tools is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine requirements of sheet material to be used from specifications, job sheets or work instructions and customer requests
		1.5	Identify process to be used to fabricate product
2	**Develop geometric shape**	2.1	Develop lay flats for regular solid rectilinear shapes
		2.2	Develop lay flats for regular curved/circular shapes
		2.3	Develop lay flats for transition pieces
		2.4	Develop lay flats for complex 3-D shapes
3	**Orient required shape to suit directional differences of sheet**	3.1	Identify directional properties in sheet
		3.2	Identify sheet-related directional requirements of product
		3.3	Identify orientations and alignments of lay flats with sheet
4	**Mark out and cut sheet**	4.1	Identify and control hazards
		4.2	Place lay flat on sheet and arrange lay flats to minimise waste
		4.3	Prevent lay flat moving and mark sheet, as required, using lay flat
		4.4	Cut sheet to meet requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		4.5 Identify typical problems and take appropriate remedial action
		4.6 Perform final verification to meet product requirements
5	**Store templates/lay flats**	5.1 Clean lay flats after use
		5.2 Label lay flat using identification protocol
		5.3 Record required directionality information with lay flat
		5.4 Store lay flats according to procedures
		5.5 Complete logs and reports according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Sheets include one (1) or more of the following:

- reinforcing:
  - woven
  - non-woven
- pre-impregnated (pre-preg)
- cores
- timber, including medium density fibreboard (MDF) and plywood
- filler material

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements of sheet material includes the following:	• strength • flexibility/rigidity • thickness • density • directionality • drape • operating temperature
Regular rectilinear shapes include one (1) or more of the following:	• rectangular prisms • cubes • portions of prisms and cubes • similar shapes
Regular curved shapes include one (1) or more of the following:	• cylinders • spheres • segments of cylinders and spheres • similar shapes
Transition pieces include one (1) or more of the following:	• cones • pyramids • portions of cones and pyramids • square to round • tee piece • lobster back • similar shapes
Complex 3-D shapes include the following:	• other 3-D shapes which may need to be fabricated and which may be composed of a number of components of the above shapes
Alignment includes the following:	• warp • weft • selvedge • other features of the sheet • the nesting of lay flats to optimise the use of materials and minimise waste

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Typical problems include one (1) or more of the following:	• identifying directionality in sheet • identify a feature to provide alignment • products requiring multidirectional properties

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26006A Mark and cut sheets for composite use

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26006 Mark and cut out sheets for composite use

Modification History

Release 1. Supersedes and is equivalent to MEM26006A Mark and cut sheets for composite use

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, product drawings, customer requests for marking and cutting sheets for composite use
- developing lay flats for geometric shapes
- marking out and cutting sheets taking into account the directional properties and alignments of lay flats and minimising waste
- identifying typical problems and taking appropriate remedial action
- cleaning, labelling, recording directionality information and storing lay flats in accordance with procedures
- completing all documentation and reports, including items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to marking and cutting sheets for composite use
- orientation of plies/reinforcing
- direction of fibres (e.g. unidirectional, quad directional and on bias)
- weaves (e.g. plain, twill and satin)
- use for curves and compound curves
- creating patterns for a lay flat
- 3-D development of shapes.

Assessment Conditions

- Assessors must:

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  - have vocational competency in marking and cutting sheets for composite use at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26007 Select and use reinforcing appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26007A Select and use reinforcing appropriate for product

Application

This unit of competency defines the skills and knowledge required to select specified reinforcement. It includes the science of reinforcing.

This unit does not cover the selection of reinforcing for a structurally designed composite, although it can include working with a person undertaking a structural design and it can cover the redesign of an existing product (e.g. using a different process) or the design of a new product similar to an existing product.

Where the selection of a suitable resin system is required unit MEM26008 Select and use resin systems appropriate for product should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine requirements of reinforcing to be used from specifications, job sheets or work instructions and customer requests
		1.5	Select appropriate process to be used to fabricate product
2	**Select most appropriate reinforcing for job**	2.1	Compile specification of required reinforcing properties
		2.2	Compare required properties with specifications of available reinforcing
		2.3	Select most appropriate reinforcing
3	**Evaluate selected reinforcement**	3.1	Fabricate a sample using the selected reinforcing and nominated resin system
		3.2	Conduct/organise for relevant tests
		3.3	Evaluate test results against product requirements
		3.4	Review fabrication process and make any required changes to reinforcing or process
4	**Fabricate product**	4.1	Identify and control hazards
		4.2	Prepare selected reinforcing including cutting to size/shape and any pre-treatment, as required
		4.3	Lay reinforcing in correct direction, including fibre orientation and fibre pre-forming, as appropriate
		4.4	Mix nominated resin system, as required
		4.5	Fabricate product using selected process and minimise

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	waste
	4.6 Review product compared to requirements
	4.7 Review reinforcing selection and fabrication process
	4.8 Identify areas for improvement and take appropriate actions
	4.9 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements of reinforcing include the following:	• strength • flexibility/rigidity • directionality • drape • operating temperature
Most appropriate reinforcing includes the following:	• compliance with product requirements • greatest ease of use in manufacture • best financial return • greatest sustainability contribution
Areas for improvement	• cost/benefit of different reinforcing systems

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

include one (1) or more of the following:	• selecting a reinforcing suited to the fabrication process
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26007A Select and use reinforcing appropriate for product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26007 Select and use reinforcing appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26007A Select and use reinforcing appropriate for product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications formulas/recipes, batch sheets, product drawings, customer requests for selecting and using reinforcing appropriate for product
- considering all reasonably available reinforcing when selecting and choosing the appropriate product
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste in accordance with specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using reinforcing appropriate for product
- coloured fibres
- fibre types, costs and source (e.g. country/company)
- life cycle assessment
- types of weave and material
- non-woven reinforcing (e.g. unidirectional, milled and chopped)
- how you buy reinforcing (e.g. toe, strands, gsm, width and weight in product)
- how the reinforcing is arranged
- exotic and hybrid reinforcing.

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Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and using reinforcing appropriate for product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26008 Select and use resin systems appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26008A Select and use resin systems appropriate for product

Application

This unit of competency defines the skills and knowledge required to select and use appropriate resins and resin systems. It includes the chemistry of resins.

Where the selection of a suitable reinforcing system is required unit MEM26007 Select and use reinforcing appropriate for product should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine product**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements		requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine requirements of resin system from specifications, job sheets or work instructions and customer requests
		1.5	Select appropriate process to be used to fabricate product
2	**Select most appropriate resin/resin system for job**	2.1	Determine performance outcomes required from resin
		2.2	Interpret specifications of available resins
		2.3	Compare required properties with specifications of available resin systems
		2.4	Interpret safety data sheets (SDS) for possible resin systems
		2.5	Select most appropriate resin
3	**Evaluate selected resin system**	3.1	Identify current conditions impacting on resin chemistry
		3.2	Identify adjustments which can be made to meet current conditions
		3.3	Make allowable adjustments and monitor result
		3.4	Fabricate a sample using the selected resin system and nominated reinforcing
		3.5	Conduct/organise for relevant tests
		3.6	Evaluate test results against product requirements
		3.7	Review fabrication process and make any required changes to resin system or process
4	**Fabricate product**	4.1	Identify and control hazards
		4.2	Prepare nominated reinforcing, including cutting to size/shape and any pre-treatment, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.3 Lay reinforcing in correct direction, including fibre orientation and fibre pre-forming, as appropriate
	4.4 Make any appropriate adjustments to the resin system recipe
	4.5 Mix selected resin system, as required
	4.6 Fabricate product using selected process and minimise waste
	4.7 Review product compared to requirements
	4.8 Review reinforcing selection and fabrication process
	4.9 Identify areas for improvement and take appropriate actions
	4.10 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements of resin system include the following:	• strength • flexibility/rigidity • surface finish and colour • shrinkage • chemical/ultraviolet (UV)/environmental resistance

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- operating temperature and heat distortion temperature
- recyclability

Most appropriate resin includes the following:

- compliance with product requirements
- greatest ease of use in manufacture
- best financial return
- greatest sustainability contribution

Resin system adjustments include one (1) or more of the following:

- temperature
- humidity
- required cure time

Adjustments may only be made within the allowable limits of the system being used

Areas for improvement include one (1) or more of the following:

- cost/benefit of different resin systems
- selecting a resin system suited to the fabrication process

Sustainability includes the following:

- survival of the ecology/physical environment
- economic viability
- social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26008A Select and use resin systems appropriate for product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26008 Select and use resin systems appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26008A Select and use resin systems appropriate for product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, safety data sheets (SDS), formulas/recipes, batch sheets, product drawings, customer requests for selecting and using resin systems appropriate for product
- considering all reasonably available resin systems when selecting and choosing the appropriate product
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste as per specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports including items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using selecting and using resin systems appropriate for product
- physical and chemical properties of resins
- resin types, cost and source
- catalyst types and systems (e.g. polyester and vinyl ester)
- hardener types (e.g. epoxy and phenolic)
- fillers and thickeners (e.g. mineral extenders, milled and cut fibre)
- safety data sheets (SDS) appropriate to the resin system selected

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- catalyst hazards (e.g. self-accelerating decomposition temperature (SADTs)) and control measures associated with selecting and using resin systems appropriate for product, including housekeeping.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and using resin systems appropriate for product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26009 Select and use cores and fillers appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26009A Select and use cores and fillers appropriate for product

Application

This unit of competency defines the skills and knowledge required to select and use appropriate cores and/or fillers.

Where the selection of suitable reinforcing required unit MEM26007 Select and use reinforcing appropriate for product should also be selected.

Where the selection of a suitable resin system is required unit MEM26008 Select and use resin systems appropriate for product should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine requirements of core and/or filler from specifications, job sheets or work instructions and customer requests
		1.5	Select appropriate process to be used to fabricate product
2	**Select most appropriate core and/or fillers for job**	2.1	Compile specification of required composite properties relevant to the core and/or filler
		2.2	Compare required properties with specifications of available cores and/or fillers
		2.3	Select most appropriate core and/or filler
3	**Evaluate selected core and/or filler**	3.1	Fabricate a sample using the selected core and/or filler and nominated resin and reinforcing system
		3.2	Conduct/organise for relevant tests
		3.3	Evaluate test results against product requirements
		3.4	Review fabrication process and make any required changes to core, filler or process
4	**Fabricate product**	4.1	Identify and control hazards
		4.2	Prepare selected core and/or filler, as required
		4.3	Lay core in correct direction, including directional properties, as appropriate
		4.4	Prepare nominated reinforcing, including cutting to size/shape, packaging into kits and ant pre-treatment, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.5 Lay reinforcing in correct direction including fibre orientation and fibre pre-forming, as appropriate
	4.6 Mix nominated resin system, as required
	4.7 Prepare and incorporate core and/or filler, as required
	4.8 Fabricate product using selected process and minimise waste
	4.9 Review product compared to requirements
	4.10 Review core and/or filler selection and fabrication process
	4.11 Identify areas for improvement and take appropriate actions
	4.12 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fillers include the following:	• particulate materials which can be added to the composite matrix to vary the bulk, stiffness, density or other properties of the final composite

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Requirements of core include the following:	• stiffness/flexibility • directionality • density • shear strength • operating temperature • provision of thickness • provision of some rigidity • thermal and acoustic insulation, where appropriate • but not the significant structural strength provided by reinforcing
Most appropriate core/filler includes the following:	• compliance with product requirements • greatest ease of use in manufacture • best financial return • greatest sustainability contribution
Areas for improvement include one (1) or more of the following:	• cost/benefit of different core/filler systems • selecting a core/filler suited to the fabrication process • air/vapour entrapment • bonding/delaminating • contamination
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26009A Select and use cores and fillers appropriate for product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26009 Select and use cores and fillers appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26009A Select and use cores and fillers appropriate for product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, safety data sheets (SDS), formulas/recipes, batch sheets, product drawings and customer requests for selecting and using cores and fillers appropriate for product
- considering all reasonably available core and/or fillers when selecting and choosing the appropriate product
- preparing cores, as required
- preparing fillers, as required
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste as per specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to selecting and using cores and fillers appropriate for product
- types of cores
- chemical makeup of cores, including urethane, polyvinyl chloride (PVC), styrene acrylonitrile (SAN) (e.g. Corefell), polymethacrylimide (PMI) (e.g. Rohacell), wood (e.g. end grain balsa), cellulose (e.g. phenolic coated paper), polypropylene (PP), polyethylene (PE), aluminium honeycomb and aramid honeycomb (e.g. Nomex)
- types of fillers including syntactic foam

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- machining techniques
- function of cores and fillers
- bonding of cores and fillers
- wettability of cores and fillers by the resin
- properties of cores and fillers and their contributions to the properties of the composite
- interrelationship between cores, fillers and matrix
- modes of core failure
- sustainability considerations
- SDS appropriate to the chemical makeup of cores selected.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and using cores and fillers appropriate for product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26010 Store and handle composite materials

Modification History

Release 1. Supersedes and is equivalent to MEM26010A Store and handle composite materials

Application

This unit of competency defines the skills and knowledge required to recognise hazards, shelf life, commercial and other issues controlling appropriate storage and handling of materials used to make composites.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 2

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify properties and characteristics of materials used**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			(PPE) in accordance with SOPs
		1.4	List all materials used on site
		1.5	Interpret safety data sheet (SDS) for each material
		1.6	Identify relevant manual handling issues
		1.7	Identify and define environmental hazards for each material
		1.8	Categorise materials into groups based on their hazards and determine appropriate hazard controls
2	**Identify key factors effecting storage and handling**	2.1	Identify requirements for dangerous goods licence
		2.2	Identify environmental regulation requirements
		2.3	Identify usage patterns and frequencies
		2.4	Identify cost sensitivity to volume purchased
		2.5	Identify shelf life
3	**Determine appropriate storage and handling protocols**	3.1	Check manufacturer’s storage and handling recommendations/requirements
		3.2	Check SDS and dangerous goods/Environment Protection Agency (EPA)/WHS requirements
		3.3	Check company usage requirements
		3.4	Resolve conflicts between different requirements
		3.5	Prepare storage and handling procedure for materials
4	**Store and handle materials in accordance with protocols**	4.1	Identify and control hazards
		4.2	Use required handling aids
		4.3	Move and store materials in accordance with procedures
		4.4	Monitor storage and handling of materials and identify areas for improvement and take appropriate action, as required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.5 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Materials include one (1) or more of the following:	• resins • catalysts • promoters • solvents • reinforcing • cores • fillers • pigments • mould release • other materials used directly or indirectly in making products

Dangerous goods licence includes the following:	• the dangerous goods licence conditions can vary between states/territories and councils but will typically cover conditions related to:
	  • fire
	  • storage
	  • the fee payable

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Environmental regulations include the following:	• trade waste • atmosphere • other wastes • other emissions
Hazard controls include the following:	• elimination • substitution • isolation • engineering controls • administration controls
Storage hazards include the following:	• chemical hazards (e.g. fire) • physical hazards (e.g. manual handling) • cost hazards (e.g. economic purchasing quantity *versus* shelf life) • efficiency hazards (e.g. having the material where you need it when you need it)
Areas for improvement include one (1) or more of the following:	• conflicting requirements • inadequate storage facilities

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26010A Store and handle composite materials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26010 Store and handle composite materials

Modification History

Release 1. Supersedes and is equivalent to MEM26010A Store and handle composite materials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting safety data sheets (SDS), formulas/recipes, batch sheets for storing and handling composite materials
- listing all materials on site
- identifying all hazards and implementing appropriate hazard control measures based on the hierarchy of control
- moving materials using appropriate manual handling techniques and mechanical handling devices to appropriate storage site in accordance with procedures
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- SDS and product data sheets
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to the handling and storage of composite materials
- the hierarchy of hazard control measures
- material registers (e.g. set up hazardous goods register, maintain it and use it)
- bunding and ventilation
- handling and storage and impact on product
- contamination (e.g. from water)
- storage temperature (e.g. low temperature for catalyst).

Assessment Conditions

- Assessors must:

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  - have vocational competency in storing and handling composite materials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26011 Determine materials and techniques for a composite component or product

Modification History

Release 1. Supersedes and is equivalent to MEM26011A Determine materials and techniques for a composite component or product

Application

This unit of competency defines the skills and knowledge required to select and use resin system/reinforcing combinations for a composite product. It includes the science of reinforcing, and core and resin interactions. It also includes basic design of a composite component/product but does not include structural design.

This unit builds on the units covering the selection and use of reinforcing and resins and in particular covers the interactions between resins and reinforcement.

Flow of fluid in porous media is described by Darcy's Law and this will need to the applied in this unit.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM26007	Select and use reinforcing appropriate for product
MEM26008	Select and use resin systems appropriate for product
MEM26009	Select and use cores and fillers appropriate for product

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Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine requirements of resin systems from specifications, drawings, job sheets or work instructions and customer requests
		1.5	Determine requirements of reinforcing and cores
		1.6	Select appropriate process to be used to fabricate product
2	**Identify suitable resin/reinforcement/ core systems**	2.1	Examine previous laminate schedules for similar requirements
		2.2	Short list suitable resin systems, reinforcing/reinforcing combinations and cores
3	**Evaluate properties of different resin/ reinforcement/ core combinations**	3.1	Determine interactions between resin systems and reinforcing and cores
		3.2	Select most appropriate combination of resin systems, reinforcing and cores
		3.3	Develop a laminate schedule to meet all requirements
		3.4	Fabricate a sample of the most appropriate combination
		3.5	Conduct/organise for relevant tests
		3.6	Evaluate test results against product and sustainability requirements
		3.7	Review selection and fabrication process and make any

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
		required changes to appropriate combination or process
4	**Use selected combination for product**	4.1 Identify and control hazards
		4.2 Prepare selected reinforcing, including cutting to size/shape and any pre-treatment, as required
		4.3 Lay reinforcing in correct direction, including fibre orientation and fibre pre-forming, as appropriate
		4.4 Prepare selected core, including cutting to size/shape, and any pre-treatment, as required
		4.5 Lay core is correct direction, including directional properties, as appropriate
		4.6 Make any appropriate adjustments to the resin system recipe
		4.7 Mix selected resin system, as required
		4.8 Fabricate product using selected process and minimise waste
		4.9 Review product compared to requirements
		4.10 Review material selection and fabrication process
		4.11 Identify areas for improvement and take appropriate actions
		4.12 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Most appropriate combination includes the following:

- compliance with product requirements
- greatest ease of manufacture
- best financial return
- greatest sustainability contribution

Requirements of core include the following:

- stiffness/flexibility
- directionality
- density
- operating temperature
- provision of thickness
- provision of some rigidity
- thermal and acoustic insulation where appropriate
- but not the significant structural strength provided by reinforcing

Requirements of resin system include the following:

- strength
- flexibility/rigidity
- surface finish and colour
- chemical/ultraviolet (UV)/environmental resistance
- operating temperature
- recyclability

Resin system adjustments include one (1) or more of the following:

- temperature
- humidity
- required cure time

Adjustments may only be made within the allowable limits of the system being used

Areas for improvement include one (1) or more of the following:

- cost/benefit of different combinations
- selecting a combination suited to the fabrication process
- maximising sustainability

Sustainability includes the following:

- survival of the ecology/physical environment
- economic viability
- social sustainability

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26011A Determine materials and techniques for a composite component or product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26011 Determine materials and techniques for a composite component or product

Modification History

Release 1. Supersedes and is equivalent to MEM26011A Determine materials and techniques for a composite component or product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, product drawings and customer requests for determining materials and techniques for a composite component or product
- considering all reasonably available combinations of resin systems, reinforcing and cores
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste as per specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using materials and techniques for a composite component or product
- cost against known processes, including labour and machine output
- principles of adhesion and substrate/resin interactions
- bonding within and between composites, including:
  - inter-laminar delamination
  - secondary bonding delamination
- resin/reinforcement compatibility
- resin penetration
- permeability of reinforcement

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- sustainability considerations
- Darcy's Law and its application to the flow of resins through porous media (e.g. reinforcing and cores).

Assessment Conditions

- Assessors must:
  - have vocational competency in determining materials and techniques for a composite component or product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26012 Record and trial work processes for one-off composite products

Modification History

Release 1. Supersedes and is equivalent to MEM26012A Record and trial work processes for one-off composite products

Application

This unit of competency defines the skills and knowledge required to take a one-off/prototype product or a new product/process from an internal or external developer and turn this into a standard manufacturing process which works and can be used in the plant.

Where the organisation of composite trials is required unit MEM26018 Organise composite trials should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify proposed**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	benefits/ outcomes of new product/ process	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Confirm deliverables expected by customer
		1.4	Confirm benefits expected by organisation
		1.5	Identify any existing products with similar expectations
		1.6	Note any relevant issues with existing similar products
2	**Sketch a process map/flow chart of proposed process**	2.1	Determine processes and identify order of process steps to be used
		2.2	Draw process map/flow chart of proposed process
		2.3	Annotate key resources, including materials, labour, time and money to map/flow chart
		2.4	Examine map/flow chart for possible improvements and redraw, as appropriate
3	**Compare proposed process with current standard processes**	3.1	Identify processes and materials which will be new to/changed from/deleted from existing similar process used by the organisation
		3.2	Identify areas of improvement in the existing similar process
		3.3	Identify hazards and appropriate hazard controls
		3.4	Develop procedures for new/modified steps
4	**Draft procedures for new product/ process**	4.1	Locate appropriate template for procedures
		4.2	Observe and record prototype
		4.3	Draft procedures from successful prototype steps in appropriate format
5	**Evaluate draft procedures**	5.1	Keep tally of resources used
		5.2	Compare production to procedures

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.3 Compare outcomes with expectations
	5.4 Identify any required changes and take appropriate action
6 **Draft new procedures and obtain authorisation**	6.1 Draft workable procedures
	6.2 Obtain authorisation of new procedures, as required
	6.3 Standardise procedures
	6.4 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Deliverables expected by customer include one (1) or more of the following:	• technical specification • aesthetic requirements • other quality expectations • cost/price expectations • quantity and delivery schedules
Process improvements address one (1) or more of the following:	• over-production • delay • transportation • over-processing • excess inventory/work in progress (WIP)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- excess motion
- defects
- untapped human potential

Required changes include one (1) or more of the following:

- multiple ways of doing the same job
- waste built into procedures
- aligning procedures with good practice

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26012A Record and trial work processes for one-off composite products

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26012 Record and trial work processes for one-off composite products

Modification History

Release 1. Supersedes and is equivalent to MEM26012A Record and trial work processes for one-off composite products

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes and batch sheets for determining materials and techniques and customer requests for recording and trialling work processes for one-off composite products
- sketching a process map/flow chart of proposed process and annotating key resources and examining possible improvements
- comparing proposed process with standard processes and identifying any required changes and taking appropriate remedial action
- developing draft procedures taking into account the process mapping and consulting and obtaining authorisation of new set of workable procedures and standardise new procedures
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- formulas/recipes and batch sheets for determining materials and techniques and customer requests for recording and trialling work processes for one-off composite products
- use of production tools (e.g. one-off or multiple products)
- limits of size which suggest easiest/most cost effective way to produce product
- fibre/resin ratio
- process mapping
- resource identification
- evaluation of procedures and outcomes
- resources wastage/savings calculations
- hazards and the hierarchy of hazard control measures
- available resources

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- recording procedures for resource usage
- report requirements and procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in recording and trialling work processes for one-off composite products at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26013 Select and use composite processes or systems appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26013A Select and use composite process or systems appropriate for product

Application

This unit of competency defines the skills and knowledge required for the selection of processes or systems for the redesign of an existing product (e.g. using a different process) or the design of a new product similar to an existing product.

Where the selection of suitable materials is required unit MEM26011 Determine materials and techniques for a composite component or product should also be chosen.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	process requirements of the product	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine physical, chemical and aesthetic characteristics of the product
		1.5	Determine production volume and delivery schedule
		1.6	Determine regulatory requirements
2	**Select most appropriate process/ system**	2.1	Identify processes which can deliver requirements of product
		2.2	Determine the capability of the organisation to use the processes and meet the requirements
		2.3	Evaluate each process against the requirements
		2.4	Select most appropriate process
		2.5	Fabricate a sample using most appropriate process
		2.6	Conduct/organise for relevant tests
		2.7	Evaluate test results
		2.8	Review test results against product and sustainability requirements
		2.9	Review selected fabrication process and make any required changes to process
3	**Use process to make product**	3.1	Identify and control hazards
		3.2	Fabricate product using selected process and minimise waste
		3.3	Review product compared to requirements
		3.4	Review fabrication process
		3.5	Identify areas for improvement and take corrective

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	actions
	3.6 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Physical characteristics of product include the following:	• size • shape • weight • requiring one/two part mould • light weight • high strength • erosion resistant
Chemical characteristics of product include the following:	• corrosion resistant • fire retardant • ultraviolet (UV) resistant
Aesthetic characteristics of product include the following:	• finish (e.g. gloss, buffed and matt) • colour
Regulatory requirements include one (1) or more of the following:	• dangerous goods • WHS • Environmental Protection Agency (EPA)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Areas for improvement include one (1) or more of the following:	• cost/benefit of different processes • selecting a process suited to the customer needs • selecting a process within the organisation capability • maximising sustainability
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26013A Select and use composite process or systems appropriate for product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26013 Select and use composite processes or systems appropriate for product

Modification History

Release 1. Supersedes and is equivalent to MEM26013A Select and use composite process or systems appropriate for product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets for selecting and using composite processes or systems appropriate for product
- considering all reasonably available processes in selecting and choosing the appropriate processes or systems, including technical, practical, cost and sustainability criteria
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste in accordance with specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using composite processes or systems appropriate for product
- cost analysis for each process to select best process
- technical standards/suitability
- mechanical stresses
- life cycle assessment for each process
- ease of manufacture
- testing criteria
- failure modes effects analysis (FMEA)
- typical applications of each major type of process, strengths and weaknesses

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- grid analysis
- hazards and the hierarchy of hazard control measures
- product characteristics design requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and using composite process or systems appropriate for product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26014 Adjust resin chemicals for current conditions

Modification History

Release 1. Supersedes and is equivalent to MEM26014A Adjust resin chemicals for current conditions

Application

This unit of competency defines the skills and knowledge required to apply knowledge of resin chemistry, particularly catalysis and resin curing, to make adjustments to the chemistry to suit current requirements caused by weather, job specifications or other factors and requires knowing the limits of these adjustments and having discussions with suppliers/manufacturers regarding resin chemistry.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify variables for the chemistry of resin types
		1.5	Identify impacts of environmental changes on resin chemistry
		1.6	Observe current environmental conditions
		1.7	Predict impact of current conditions on resin chemistry
		1.8	Discuss resin chemistry and adjustment limitations with suppliers
2	**Identify adjustments which may be made to meet current conditions**	2.1	Identify limits of resin chemistry adjustment
		2.2	Determine impact on resin chemistry of changing resin composition
		2.3	Select resin composition changes to counteract impact of current conditions
		2.4	Compare selected composition changes with adjustments allowed by manufacturer of resin system
		2.5	Select most appropriate resin composition changes
		2.6	Identify alternative process changes to adjust for conditions
		2.7	Fabricate a sample using the selected adjustment
		2.8	Conduct/organise for relevant tests
		2.9	Evaluate test results against product requirements
		2.10	Review resin composition changes and take appropriate action
3	**Fabricate product using adjusted composition/**	3.1	Identify and control hazards
		3.2	Make any appropriate adjustments to the resin system recipe

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
conditions	3.3 Prepare materials, tools and equipment and minimise waste
	3.4 Review product compared to requirements
	3.5 Review chemistry modification process
	3.6 Identify areas for improvement and take appropriate actions
	3.7 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Resin chemistry includes the following:	• process of curing/cross linking of resins • rate of cure and change of properties over cure time • changes in viscosity and other flow properties during progress of cure • final properties of resin post-cure
Environmental changes include one (1) or more of the following:	• temperature • humidity • air flow/wind • solar/ultraviolet (UV) insolation

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Resin composition includes the following:	• resin/catalyst ratio • resin/promoter ratio • resin/catalyst/promoter ratios • changing temperature of resin components (e.g. using chilled catalyst or resin) • ratios of other resin system components
Most appropriate resin composition changes include one (1) or more of the following:	• comply with product requirements • adjust for the current conditions • have greatest ease of use in manufacture • have best financial return • have greatest sustainability contribution
Alternative process changes include one (1) or more of the following:	• controlling the environmental conditions • moving the timing of the job to when conditions are more favourable (e.g. at night) • moving the location of the job to where conditions are more favourable (e.g. in plant, different site and in shade)
Conditions that can be adjusted to improve outcomes include the following:	• unusually hot/cold workplace/weather • extreme humidity • very tight/unusual specification of properties required of product • high/low air flow/wind
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26014A Adjust resin chemicals for current conditions

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26014 Adjust resin chemicals for current conditions

Modification History

Release 1. Supersedes and is equivalent to MEM26014A Adjust resin chemicals for current conditions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes and batch sheets for adjusting resin chemicals for current conditions
- identifying variables of resin chemistry
- interpreting environmental changes that have an impact on resin chemistry
- discussing resin chemistry and adjustment limitations with suppliers
- identifying limits of resin chemistry adjustment
- selecting resin composition changes to suit conditions
- selecting the most appropriate resin composition changes that are sound and complying with product requirements
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes
- fabricating the final product using adjusted composition/conditions and minimising waste in accordance with specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- summer/winter catalyst
- resin chemistry
- resin chemistry adjustment limits
- resin composition
- hazards and the hierarchy of hazard control measures

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- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using resin chemicals
- curing/cross linking chemistry
- basic chemistry of resin manufacture
- effects of temperature (workplace and materials), humidity, air flow (wind) and concentration
- effect of adjustments in the workplace (and why)
- adjustments available from supplier
- report requirements and procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in adjusting resin chemicals for current conditions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM26015 Select and apply repair techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26015A Select and apply repair techniques

Application

This unit of competency defines the skills and knowledge required to select and apply appropriate composites repair techniques.

Where the selection of a suitable resin system is required unit MEM26008 Select and use resin systems appropriate for product should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 6

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Diagnose the item needing repair**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Clean out damaged area
		1.5	Determine accessibility of area to be repaired
		1.6	Inspect damaged area
		1.7	Identify original materials of construction
		1.8	Determine cause of failure to the extent possible
2	**Determine requirements of the repair**	2.1	Check insurance status
		2.2	Confirm intended usage of composite
		2.3	Determine extent of repair required (e.g. structural or cosmetic)
		2.4	Undertake appropriate incidental design
		2.5	Agree on scope of repair
3	**Select most appropriate repair technique for job**	3.1	Check the availability of standard repair kits/components and techniques
		3.2	Short list suitable repair techniques and materials
		3.3	Evaluate suitability of possible repair techniques and materials
		3.4	Select appropriate repair process
		3.5	Select appropriate materials for repair
		3.6	Conduct and evaluate tests, as appropriate
4	**Undertake repair**	4.1	Identify and control hazards
		4.2	Create necessary access to damaged area
		4.3	Prepare area, materials and tools and equipment required for repair

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	4.4 Undertake required repair and minimise waste
	4.5 Review repaired product compared to requirements
	4.6 Review material selection and fabrication process
	4.7 Identify areas for improvement and take appropriate actions
	4.8 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Appropriate repair process includes the following:	• compliance with product requirements • greatest ease of execution • best financial return • greatest sustainability contribution
Repair techniques include one (1) or more of the following:	• hand moulding • hand lay-up skills • applying resin infusion techniques • applying syringe technique • using ultraviolet (UV) curable resin systems • using other open and closed mould techniques

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Incidental design includes the following:	• improves on an original design weakness (e.g. might be shown up by the failure being repaired) • changes the original design to incorporate current techniques, materials or practices • better meets customer needs
Preparing materials includes the following:	• cutting to size and shape, as required • any pre-treatment required • calculating amount of resin and resin components required • mixing resin systems
Process considerations include one (1) or more of the following:	• cost/benefit of different repair techniques and materials • customer wants more improvement than is technically feasible • customer wants more improvements than insurance will pay for
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26015A Select and apply repair techniques

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26015 Select and apply repair techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26015A Select and apply repair techniques

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes and batch sheets for selecting and applying composites repair techniques
- considering all reasonably available composites repair techniques and materials when selecting and choosing the appropriate technique
- undertaking appropriate incidental design which includes minor design incidental to conducting a composites repair, as required
- short listing and evaluating appropriate composites repair techniques
- undertaking composites repair to meet product requirements
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- different composites repair techniques (e.g. patch repair, honeycomb repair and resin surface repair), uses and limitations
- dedicated composites repair materials
- blocking techniques
- hot bonders
- temporary moulds
- repairing internal or external surfaces
- repairing against a mould
- mixing and using gel coat and gel coat additives (e.g. filler, wax, catalyst and pigment)
- laminate defects, including air entrapment, moisture entrapment, osmosis and delamination.

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Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and applying repair techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26016 Select and use joining techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26016A Select and use joining techniques

Application

This unit of competency defines the skills and knowledge required to join composites to other composite components or other materials.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 6

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Select and use appropriate personal protective equipment (PPE) in accordance with SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.4	Determine finished application properties
		1.5	Develop required technical specifications of join
		1.6	Identify properties of surfaces to be joined
2	**Select most appropriate joining system**	2.1	Short list suitable joining techniques and materials
		2.2	Compare technical properties of different joining systems with requirements
		2.3	Check safety data sheets (SDS) of joining materials
		2.4	Determine preparation required of surfaces to be joined
		2.5	Select most appropriate joining system
		2.6	Make sample join using the system
		2.7	Conduct/organise for relevant tests
		2.8	Evaluate test results against product requirements
		2.9	Review fabrication process and make any required changes to system
3	**Complete the required join**	3.1	Identify and control hazards
		3.2	Prepare surface, as required
		3.3	Prepare tools, equipment and materials required for join
		3.4	Undertake required join and minimise waste
		3.5	Review joined product compared to requirements of the job
		3.6	Review materials and techniques selected
		3.7	Identify areas for improvement and take appropriate actions
		3.8	Complete any required documentation/reporting according to SOPs

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Finished application properties include the following:	• permanent/removable • waterproof/chemical resistant • structural rigidity • strength (tensile, compressive, shear and torsional) • aesthetic
Properties of surfaces to be joined include the following:	• materials of construction • physical properties (e.g. strength and rigidity) • surface properties (e.g. surface finish and surface treatment/coatings) • size and shape
Joining system includes one (1) or more of the following:	• bonding (e.g. adhesive, gluing, ethacrylates, sikaflex and epoxy) • using composite materials (e.g. Probond, Divelett, K-Lite and Eurmere) • secondary bonding – cured composite to cured composite • using mechanical fasteners (e.g. bolts and rivets)
Preparation of surfaces includes one (1) or more of the following:	• solvent or other chemical cleaning • chemical etching • mechanical preparation such as blasting, buffing • surface smoothing (e.g. machining) • making of holes or other physical locking features

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Most appropriate joining system includes the following:	• compliance with product requirements • greatest ease of joining • best financial return • greatest sustainability contribution
Requirements of the job include one (1) or more of the following:	• rigid or flexible • water, ultraviolet (UV), chemical or fire resistant • or have other properties, as well as the required strength
Areas for improvement include one (1) or more of the following:	• incompatible requirements • hazardous materials/preparation methods • non-uniform join
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26016A Select and use joining techniques

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26016 Select and use joining techniques

Modification History

Release 1. Supersedes and is equivalent to MEM26016A Select and use joining techniques

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, safety data sheets (SDS) for selecting and using joining techniques
- considering all reasonably available joining techniques and materials when selecting and choosing the appropriate technique
- preparing surfaces to be joined
- making a sample join and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- completing the required join using hand and power tools, applying assembly techniques and applying bonding joiner and techniques and minimising waste in accordance with procedures
- identifying areas for improvement and taking appropriate action
- completing all documentation and reporting items requiring further action in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- adhesives (e.g. plexus – methylmethacrylate)
- sealants (e.g. sikaflex – silicon or butyl mastic)
- mechanical joining
- substrates and interactions with joiner
- surface preparation of substrate
- application methods
- clamping forces (minimum and maximum)
- adhesive/sealant thickness
- primers

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- design rules around fastening (e.g. minimum area for pop rivets, rivet spacing and rivet patterns)
- edge finish of pilot holes
- quality requirements with the hole preparation and with the installation of fasteners
- radius of edge of laminate
- effect of flatness and smoothness of joining surfaces
- substrate composition in joining area.

Assessment Conditions

- Assessors must:
  - have vocational competency in selecting and using joining techniques at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM26017 Prepare composite or other substrate surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM26017A Prepare composite or other substrate surfaces

Application

This unit of competency defines the skills and knowledge required to prepare by abrasive or chemical means, a composite surface prior to bonding/joining or coating and includes the preparation of composite surfaces and other surfaces which are used in conjunction with composites (e.g. metal surfaces).

This unit complements unit MEM26016 Select and use joining techniques.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify the chemistry of materials to be applied to the surface
		1.5	Identify the surface chemistry of the substrate
		1.6	Determine any chemical treatments needed to make the substrate compatible with the materials to be applied
		1.7	Interpret safety data sheets (SDS) for materials that may be used
		1.8	Identify the current and possible required physical states of the substrate
2	**Select most appropriate preparation technique for job**	2.1	Compile specification for required substrate preparation
		2.2	Compare possible substrate preparation methods with specification
		2.3	Select most appropriate substrate preparation
		2.4	Conduct and evaluate tests, as appropriate
		2.5	Review selection and substrate preparation and make any required changes to substrate preparation
3	**Prepare substrate**	3.1	Identify and control hazards
		3.2	Prepare substrate, as required and minimise waste
		3.3	Review result compared to requirements
		3.4	Review substrate preparation process
		3.5	Identify areas for improvement and take appropriate actions
		3.6	Clean up and perform any routine maintenance required on equipment

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.7 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Most appropriate substrate preparation includes the following:	• compliance with product requirements • greatest ease of preparation • best financial return • greatest sustainability contribution
Areas for improvement include one (1) or more of the following:	• incompatible surface applications with substrates • non-uniform substrate preparation • the use of hazardous materials
Sustainability includes the following:	• survival of the ecology/physical environment • economic viability • social sustainability

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26017A Prepare composite or other substrate surfaces

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26017 Prepare composite or other substrate surfaces

Modification History

Release 1. Supersedes and is equivalent to MEM26017A Prepare composite or other substrate surfaces

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, safety data sheets (SDS) for preparing composite or other substrate surfaces
- considering all reasonably suitable substrate preparation methods when selecting and choosing the appropriate method
- selecting the most appropriate substrate preparation and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- preparing substrate, as required, controlling blasting equipment, operating blasting equipment by hand and using chemical treatment equipment in accordance with procedures
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to preparing composite or other substrate surfaces
- methods and purposes of abrasive cleaning
- types of abrasives and their applications (e.g. sand, bead, shot, soda and grit)
- protection of non-blasted surfaces
- waste control, reuse and disposal
- hazards and the hierarchy of hazard control measures
- work health and safety (WHS) issues and environmental considerations
- surface preparation standards (e.g. surface measurement and surface finish)
- types of chemical cleaning (e.g. etching and solvents)

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- aniline preparation of aluminium.

Assessment Conditions

- Assessors must:
  - have vocational competency in preparing composite or other substrate surfaces at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26018 Organise composite trials

Modification History

Release 1. Supersedes and is equivalent to MEM26018A Organise composite trials

Application

This unit of competency defines the skills and knowledge required to trial new materials and processes and make prototypes.

The source of these trials can arise from internal improvements or new products/processes from external sources. Regardless, trials need to be conducted to 'prove' it in an industrial environment, to translate research and development into practical processes and to provide appropriate records and metrics.

This unit does not cover the selection of materials or processes but does cover the organising and analysing of trials to prove proposed new materials or processes in the production environment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify risks to be controlled
		1.5	Identify novel parts of process/materials/properties
		1.6	Compare data from past work/trials
		1.7	Obtain data for novel part of process/material
		1.8	Develop procedures which should produce the required result
		1.9	Determine required process properties
		1.10	Determine required business and sustainability measures
2	**Compare proposed process with existing and predict problem areas**	2.1	Compare proposed process with existing similar processes
		2.2	Identify points of difference
		2.3	Identify weaknesses with existing process
		2.4	Predict possible problems with trial process/materials
3	**Organise appropriate trials**	3.1	Determine scale of trial
		3.2	Ensure availability of adequate resources, including equipment, tools, materials, personnel and time
		3.3	Organise for the preparation of equipment/materials
		3.4	Conduct and monitor trial and record key observations and metrics
4	**Select**	4.1	Compare outcome with requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
appropriate manufacturing procedure	4.2 Modify procedure and repeat trial, as appropriate
	4.3 Identify areas for improvement and take appropriate actions
	4.4 Determine procedure which will yield desired results
	4.5 Record procedure in appropriate form
	4.6 Complete all required reporting and recording according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Novel part includes one (1) or more of the following:	• new resin system on standard reinforcing • new reinforcing with standard resin system • new process using standard materials • standard process and materials producing product with different properties
Process properties include the following:	• gel time • viscosity • temperature (e.g. mould, resin and ambient) • infusion time • peak exotherm (e.g. using a laser thermometer)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Business measures include the following:	• costs • time analysis • quality reliability
Scale of trial includes one (1) or more of the following:	• full scale prototype • scaled down prototype • laminate samples only • portion of laminate
Modifying procedure includes one (1) or more of the following:	• changing resin inlets • changing resin chemistry • changing other materials • modifications to process • modifications to tooling
Areas for improvement include one (1) or more of the following:	• trial procedures not workable • trial product does not meet specification • trial procedures do not meet sustainability requirements

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26018A Organise composite trials

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26018 Organise composite trials

Modification History

Release 1. Supersedes and is equivalent to MEM26018A Organise composite trials

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, design brief and data for organising composite trials
- identifying business and sustainability measures
- identifying novel parts of the process
- determining appropriate metrics before commencement of trial
- determining scale of trial and conducting trial ensuring trial procedure has a sound basis
- modifying procedure and repeating trial, as appropriate
- analysing trial results and identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- intended outcome of product
- resource requirement calculations
- design of documents for the floor
- design of trials
- design test requirements for trial
- novel parts
- appropriate metrics before commencement of trial
- trial procedure modifications
- trial procedures
- trial analysis techniques
- product improvement opportunities
- report procedures.

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Assessment Conditions

- Assessors must:
  - have vocational competency in organising composite trials at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM26019 Finish a composite product

Modification History

Release 1. Supersedes and is equivalent to MEM26019A Finish a composite product

Application

This unit of competency defines the skills and knowledge required to select and use appropriate mechanical finishing and repair techniques for a composite product.

Where gel coating is required unit MEM26001 Lay up composites using open moulding techniques, MEM26002 Lay up composites using vacuum closed moulding techniques and MEM26003 Lay up composites using pressure closed moulding techniques should also be selected as appropriate.

Where the selection and use of hand tools is required unit MEM18001 Use hand tools should also be selected.

Where the selection and use of power tools is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine product requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Determine finishing requirements, including machining, polishing, buffing, blasting, etching and making holes from specifications, drawings, job sheets or work instructions
2	**Select most appropriate finishing for job**	2.1	Compare required finish with results of different finishing methods
		2.2	Select most appropriate finishing method
		2.3	Conduct tests where appropriate, and review finishing method, as required
3	**Finish product**	3.1	Identify and control hazards
		3.2	Prepare finishing equipment, tools and materials, as required
		3.3	Finish product using selected process and minimise waste
		3.4	Review finished product compared to requirements
		3.5	Identify areas for improvement including damage to laminate from finishing process and take appropriate actions
		3.6	Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Repairs are performed on one (1) or more of the following	• gel coats • moulding imperfections • moulds • detailing
Finishing techniques include one (1) or more of the following:	• trimming • forming holes (drilling, hole saw or other penetration) using hand, power or machine tools • using jigs and fixtures • removing burrs

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26019A Finish a composite product

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26019 Finish a composite product

Modification History

Release 1. Supersedes and is equivalent to MEM26019A Finish a composite product

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, drawings, customer requests and descriptions of required use of product for finishing a composite product
- considering all reasonably appropriate finishing methods when selecting and choosing the appropriate method/technique
- finishing product using hand and power tools and machine tools, and observing finished surfaces ensuring it meets specifications and customer requests
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- deburring and sanding
- surface preparation
- preparing cut edges
- drill bits and sizes
- measurement of tools and relationship to finished size
- choice of tool
- gel coat repair, metal flake, dual colour and touch up chips
- hazards and the hierarchy of hazard control measures
- report requirements and procedures.

Assessment Conditions

- Assessors must:

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  - have vocational competency in finishing a composite product at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM26020 Identify and interpret required standards for composites

Modification History

Release 1. Supersedes and is equivalent to MEM26020A Identify and interpret required standards for composites

Application

This unit of competency defines the skills and knowledge required to identify and select relevant standards for a job that may be relevant to the redesign of an existing product (e.g. using a different process), the design of a new product similar to an existing product, or the undertaking of a repair.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		1.3	Review available standards
		1.4	Identify and select the appropriate standard that may have relevance to the job
		1.5	Interpret standard and application of standard to the job
		1.6	Compile specifications which will ensure job meets standard
2	**Undertake required work**	2.1	Ensure procedures will produce a product which meets standard
		2.2	Ensure any required testing/metrics gathering is undertaken
		2.3	Monitor production to ensure it complies with the procedures and minimise waste
3	**Check conformance to standard, as required**	3.1	Check final product complies with the standard, as required
		3.2	Identify areas for improvement and take appropriate actions
		3.3	Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Standards include one (1) or more of the following:

- Australian Standards (AS)
- International Standards Organisation (ISO)
- original equipment manufacturer (OEM) specifications
- Civil Aviation Safety Authority (CASA)
- Department of Defence (DoD)
- Australian Design Rules (ADR)

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM26020A Identify and interpret required standards for composites

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM26020 Identify and interpret required standards for composites

Modification History

Release 1. Supersedes and is equivalent to MEM26020A Identify and interpret required standards for composites

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes and batch sheets for identifying and interpreting required standards for composites
- considering all reasonably standards when selecting and choosing the appropriate standard
- undertaking required work and monitoring production to ensure it complies with the procedures
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- the hierarchy of standards vs guidance vs voluntary codes
- relevant standards
- interpretation of standards
- evidence to support meeting of standard
- accessing standards
- copyright of Australian Standards
- using standards.

Assessment Conditions

- Assessors must:
  - have vocational competency in identifying and interpreting required standards for composites at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27001 Maintain and repair stationary and mobile plant engine cooling systems

Modification History

Release 1. Supersedes and is equivalent to MEM18024B Maintain engine cooling systems

Application

This unit of competency defines the skills and knowledge required to maintain and repair the cooling systems of combustion engines used in mobile and stationary plant and equipment.

It covers servicing, preventative maintenance, diagnosis and repair of combustion engine cooling systems and components in vehicles and plant used to support manufacturing, maintenance and engineering related operations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Identify required test equipment
2	**Assess cooling system operation**	2.1	Identify normal cooling system operational performance from manufacturer specifications and work procedures
		2.2	Undertake system checks using specified test procedures and equipment
		2.3	Determine and record water/air flows, pressures and temperatures
		2.4	Isolate faults to component level and determine appropriate corrective action
		2.5	Obtain and evaluate coolant samples
		2.6	Assess component parts for reuse, repair or replacement
3	**Rectify faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Remove components selected for repair or replacement
		3.3	Repair components to manufacturer specifications where required

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Select replacement components using manufacturers' data where required
	3.5 Refit repaired or replacement components to engine
	3.6 Record test, repair and replacement activities as required
	3.7 Ensure engine is free of coolant leaks and the cooling system contains the correct level of additive/inhibitor after repair work is carried out

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Cooling systems include one (1) or more of the following:	• engine or vehicle cooling • large stationary plant combustion engine cooling • cooling towers • shutter type systems or fan drive • water type inter/after coolers • oil coolers

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Cooling system testing includes one (1) or more of the following:	• air and/or water flows
	• temperatures
	• pressures
	• assess serviceability and repair on a range of:
	  • flow/pressure actuators
	  • sensors
	  • actuators and solenoids

Typical system faults include one (1) or more of the following:	• coolant pressures
	• the presence of:
	  • steam
	  • gases
	  • oil
	  • fuel
	  • air
	• corrosion
	• contamination

Testing coolant condition includes testing for one (1) or more of the following:	• correct additives including anti-corrosion and anti-freeze
	• contamination, including:
	  • oil
	  • metal
	  • other particles

Components include one (1) or more of the following:	• sensors • caps • gauges • pumps • fan drives and motors

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18024B Maintain engine cooling systems

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Links

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Assessment Requirements for MEM27001 Maintain and repair stationary and mobile plant engine cooling systems

Modification History

Release 1. Supersedes and is equivalent to MEM18024B Maintain engine cooling systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents to maintain engine cooling systems
- checking cooling system safely in accordance with specifications and procedures and measuring and recording water/air flows, pressures and temperature of the cooling system using test equipment
- fault finding cooling system down to component level and determining applicable corrective action
- obtaining coolant samples and carrying out testing on coolant condition
- checking cooling system components for wear and clearances using appropriate test equipment to manufacturers' specifications
- undertaking numerical operations, calculations and formulae for maintaining engine coolant systems
- interpreting relevant specifications, parts lists and catalogues for replacement components
- removing, repairing and re-fitting cooling system components to engine in accordance with prescribed procedures
- testing engine for coolant performance and leaks after repairs
- reporting and documenting service, repair/replacement activities.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of heat transfer as applied to cooling systems
- effect of water treatment, contamination and corrosion on the effectiveness of cooling system operation
- components of the cooling system and their function, including:
  - engine coolant composition

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  - water pumps
  - thermostats
  - fan systems and drives
  - radiators and radiator caps
  - expansion tanks
  - hoses
  - temperature sensors and gauges
- checks and procedures to be carried out on cooling systems, including tests for:
  - corrosion
  - pressure and temperature
  - leaks
  - performance of pumps, thermostats, fans, cooling system sensors and instruments
- procedures for:
  - measuring water/air flows, pressures and temperatures in cooling systems and tools, techniques and equipment
  - testing coolant test samples and tools and equipment
  - testing components for wear and clearances and the appropriate measuring/test equipment
  - obtaining replacement parts
  - removing/replacing cooling system components from the engine
  - checking coolant levels and engine coolant leaks
  - handling hot pressurised cooling systems
  - containing and disposing of cooling system fluids released from the system
  - recording test and rectification
- variations of test results from specifications and the likely causes of those variations and appropriate corrective action to be taken
- precautions to be taken when using test equipment
- reasons for identifying faulty components for repair or replacement
- correct amount of additive/inhibitor to be added to the coolant.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining engine cooling systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27002 Test and repair compression ignition systems

Modification History

Release 1. Supersedes and is equivalent to MEM18026C Test compression ignition fuel systems

Application

This unit of competency defines the skills and knowledge required to assess the operation of compression ignition systems.

It covers the testing and repair of ignition systems used in large compression engines, including direct injection and common rail systems and repair and replacement of components.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

If the operation of plant and equipment is required, it must only be performed within the person's licensing limits or as determined by relevant regulations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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MEM18001 Use hand tools

Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess fuel system operation**	2.1	Apply knowledge of fuel injection principles and component part functions/operation to assess fuel system operation
		2.2	Start, operate and shut down diesel plant/equipment
		2.3	Undertake checks safely to prescribed procedures
		2.4	Determine and record flows, pressures and speeds
		2.5	Interpret engine and plant operating characteristics and parameters
		2.6	Interpret test results and operational data for faults and serviceability
3	**Repair compression ignition system**	3.1	Identify components to be repaired or replaced
		3.2	Select appropriate tools, equipment and materials
		3.3	Repair and replace components according to manufacturer specifications, WHS and environmental

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	requirements
	3.4 Time the high-pressure fuel pump or injectors to engine
	3.5 Use test equipment to test ignition system and set to specifications
	3.6 Record repair according to workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fuel system components include the following:

- tank
- filters
- sensors, including:
  - engine position
  - coolant temperature
  - engine mass airflow (MAF)
  - inlet air temperature
  - engine fuel pressure
  - boost pressure
  - fuel delivery
  - fuel rail pressure
- common rail
- electronic and hydraulic electronic injectors
- solenoid and piezoelectric valves
- pumps

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- engine control unit (ECU) and associated components

Final adjustment includes the setting of one (1) or more of the following:

- low/high speed
- no load/full load speed
- droop
- sensitivity
- stability
- promptness

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18026C Test compression ignition fuel systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27002 Test and repair compression ignition systems

Modification History

Release 1. Supersedes and is equivalent to MEM18026C Test compression ignition fuel systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- describing the function and operation of ignition system component parts through identification and interpretation of appropriate specifications, charts, lists, drawings, service documents and reference to fuel injection principles
- starting/operating and shutting down diesel plant/equipment
- conducting operational checks of the diesel fuel system in determining and recording fuel flows, pressures and engine speeds using appropriate test equipment in accordance with specifications and procedures
- interpreting faults from the test results and ignition system operating characteristics and parameters
- determining serviceability of the fuel system components, including:
  - engine control unit (ECU)
  - injectors
  - sensors
- removing, replacing and carrying out adjustment of ignition system components, including:
  - injectors
  - sensors, connectors and cables
  - tank
  - filters
  - fuel pumps
- undertaking calculations and numerical operations for testing compression ignition fuel systems
- timing the high-pressure fuel pump or injectors and carrying out final adjustments to engine in accordance with specifications
- recording/reporting service activities according to SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of fuel injection and function/operation of each component in a fuel injection system
- types of fuels used in compression engines, air/fuel ratios, combustion process and combustion products
- compression ignition management systems, including:
  - electronic injectors
  - electronic control systems
  - common rail systems
  - exhaust management and treatment
- procedures for starting up, operating and shutting down diesel plant and equipment
- visual and aural checks to be made on the diesel fuel system and procedures for carrying out these checks
- use of appropriate test equipment, including use of oscilloscopes, multimeters and other electrical and electronic test equipment and methods for testing:
  - high and low pressure fuel pump performance
  - oil pressures
  - injectors
  - sensors and circuits
  - exhaust composition
  - engine performance against specifications
- plant operating characteristics and parameters
- indicators of ignition system faults, including:
  - engine knock
  - difficulty in starting
  - incomplete combustion and excessive smoke
  - warning lights and diagnostic trouble codes
- causes of ignition system faults, including:
  - dirty/worn injectors
  - incorrect timing
  - poor fuel
  - poor oil
  - low compression
  - worn engine components e.g. piston rings
  - incorrect timing
  - damaged dirty air, fuel and oil filters

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- reasons for the decisions made with respect to serviceability and likely faults and causes for unserviceable systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in testing and repairing compression ignition fuel systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27003 Overhaul engine fuel system components

Modification History

Release 1. Supersedes and is equivalent to MEM18027C Overhaul engine fuel system components

Application

This unit of competency defines the skills and knowledge required to recondition and reinstall fuel system components on large stationary or mobile diesel engines.

It includes removal and cleaning of fuel system components, assessing components for wear and defects, deciding whether a component should be reconditioned or replaced, reinstallation of reconditioned components in engines and testing of reconditioned components for effective operation.

Where breakdown testing and repair of compression ignition systems is required, unit MEM27002 Test and repair compression ignition systems should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 8

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055 Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Clean and assess parts**	2.1	Disassemble components, including the use of specialised tools, according to manufacturer recommendations
		2.2	Assess fuel system components visually for abnormal wear or defects
		2.3	Interpret characteristics of surface finishes and wear patterns associated with fuel system components
		2.4	Decide whether components should be reconditioned or discarded and replaced using knowledge of fuel system and control functions, characteristics and applications
		2.5	Select appropriate cleaning method/solution and procedures
		2.6	Make parts identifiable according to their original location in the pump/injector and protect and store as required for reassembly
		2.7	Obtain and interpret measurements and part condition when determining reuse/replacement

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Recondition and set up equipment**	3.1 Recondition and replace components identified as faulty
	3.2 Assemble components according to manufacturer specifications
	3.3 Use test equipment to test components and set fuel system to specifications
	3.4 Record reconditioning of components according to workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fuel system types include one (1) or more of the following:	• port and helix • sleeve metering • unit injection • distributor • pressure/time

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18027C Overhaul engine fuel system components

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27003 Overhaul engine fuel system components

Modification History

Release 1. Supersedes and is equivalent to MEM18027C Overhaul engine fuel system components

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents for overhauling engine fuel system components
- dismantling the engine fuel system components using specialised tools and test equipment and checking parts visually for abnormal wear or defects
- identifying parts according to their original location in the pump/injector and protecting and storing them as required for reassembly
- undertaking calculations and numerical operations for overhauling engine fuel system components
- measuring and recording fuel system components using appropriate measuring equipment
- assessing components and parts for serviceability or replacement
- reconditioning, assembling and replacing components according to manufacturer specifications
- testing operation of reconditioned components to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- sequence for disassembling engine fuel components
- specialised tools required and their application
- common defects, examples and causes of abnormal wear
- characteristics of surface finishes and wear patterns for fuel system components
- method of cleaning fuel system components
- appropriate solvents for cleaning fuel systems
- procedures for:
  - cleaning, protecting and storing fuel system components

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  - marking fuel system components in readiness for reassembly
  - recording fuel system component measurements
  - reconditioning and/or replacing faulty fuel system components
  - assembling and testing fuel system components
  - setting fuel system components
- measuring instruments to be used to measure fuel system components and reasons for selecting the chosen measuring instruments
- principles of operation of diesel fuel systems
- specifications of the fuel system components
- tools, techniques and equipment required to carry out fuel system component tests.

Assessment Conditions

- Assessors must:
  - have vocational competency in overhauling engine fuel system components at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27004 Maintain and repair engine lubrication systems

Modification History

Release 1. Supersedes and is equivalent to MEM18028B Maintain engine lubrication systems

Application

This unit of competency defines the skills and knowledge required to assess lubrication system operations and repair or replace faulty components.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess lubrication system operation**	2.1	Identify lubrication system and lubricant specifications prior to any testing
		2.2	Undertake system checks safely and to prescribed procedures
		2.3	Assess lubrication system operation, including condition and appropriateness of lubricant fluid, integrity of lubrication system and condition of components
		2.4	Determine flows, pressures and temperatures and record
		2.5	Identify leaks and any sources of contamination
		2.6	Isolate faults to component level using test equipment and determine appropriate corrective action
		2.7	Evaluate results of spectrographic or laboratory analysis and make recommendations regarding adjustments to future maintenance activities
		2.8	Assess auxiliary lubrication systems for correct operation
3	**Rectify faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Select replacement components using manufacturers' data
		3.3	Remove components and refit to engine

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Make final adjustments that bring system in line with specifications
	3.5 Record test and rectification activities
	3.6 Ensure engine is free of lubricant leaks after rectification work is carried out

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Faults include one (1) or more of the following:	• low or high pressure • low or high temperature • contamination • excessive or too little consumption/flow • leaks • use of incorrect lubricant
Test equipment includes one (1) or more of the following:	• pressure/temperature gauges • flow meters
Adjustments include setting one (1) or more of the following valves to specified pressures or flows:	• bypass • regulating • relief

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18028B Maintain engine lubrication systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27004 Maintain and repair engine lubrication systems

Modification History

Release 1. Supersedes and is equivalent to MEM18028B Maintain engine lubrication systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents prior to any testing on engine lubrication systems
- conducting operational checks of engine lubrication system and determining and recording oil flows, pressures and temperature using appropriate test equipment
- identifying faults of engine lubrication system and determining corrective action
- obtaining and interpreting the results of lubricating oil tests and making recommendations to future maintenance activities
- checking auxiliary lubrication systems for correct operation in accordance with specifications
- undertaking calculations and numerical operations for maintaining engine lubrication systems
- checking lubrication system components for wear and clearances using appropriate test equipment to manufacturer specifications
- removing/refitting and adjusting lubrication system components and make final adjustments to bring system in line with specifications
- recording/reporting test and work activities.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operation of the lubrication system and procedures for testing/checking lubrication
- tests to be undertaken and equipment and techniques to be used to determine oil flows, pressures and temperatures
- procedures for:
  - recording lubrication system test results
  - analysing lubricating oil samples and reasons that apply

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    - removing/replacing lubrication system components
    - adjusting lubrication systems
    - recording test and repair activities
    - checking lubrication systems for leaks
- specifications of the lubrication system components and appropriate corrective action for faulty components
- characteristics of lubricants and application of a variety of lubricants
- likely causes of a range of out of specification test results and appropriate corrective action to be taken
- implications of out of specification test results on maintenance schedules and requirements
- reasons for installing auxiliary lubrication systems on diesel plant and equipment
- operation of the auxiliary lubrication system
- measuring equipment/techniques used to determine lubrication system component wear and clearances.

Assessment Conditions

- Assessors must:
    - have vocational competency in maintaining engine lubrication systems at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27005 Tune diesel engines

Modification History

Release 1. Supersedes and is equivalent to MEM18029B Tune diesel engines

Application

This unit of competency defines the skills and knowledge required to compression test and tune up the engine.

It applies to tune up procedures and evaluation of engine performance on compression ignition engines.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM27002	Test and repair compression ignition systems
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Compression test engine**	2.1	Remove injectors and isolate fuel system for each cylinder
		2.2	Select and fit appropriate adaptors
		2.3	Obtain, interpret, record and correct readings for adaptor used
		2.4	Use correct compression readings for adaptor
3	**Perform tune up**	3.1	Determine firing pressures and adjust to specification, as applicable
		3.2	Perform air restriction, boost, back pressure and flow tests according to manufacturer recommendations using applicable test equipment
		3.3	Record readings and determine variances from specifications
		3.4	Determine density of exhaust smoke
		3.5	Adjust valve clearance and/or timing to specifications
		3.6	Adjust injection pump or injector timing to specification
		3.7	Adjust engine parameters using methods appropriate to

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	technology of engine
	3.8 Determine if injector opening pressure is within specification and adjust, arrange replacement or repair if faulty

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engine firing pressure control adjustment methods include the following:	• reflashing of electronic control module (ECM) unit where electronic control is used
	• manual adjustment of:
	  • governor rack travel
	  • torque spring load limit
	  • over speed trips
	  • aneroid or fuel ratio control to specification

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18029B Tune diesel engines

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Assessment Requirements for MEM27005 Tune diesel engines

Modification History

Release 1. Supersedes and is equivalent to MEM18029B Tune diesel engines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents for tuning diesel engines
- removing injectors from each cylinder, isolating fuel system and fitting appropriate adaptors to each of the cylinders
- obtaining, recording and correcting compression readings for adaptor used
- determining firing pressures and adjusting to specifications
- performing tune up of diesel engine using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- procedures for:
  - removing injectors from cylinders and reasons for isolating the fuel system
  - fitting adaptors to the cylinders
  - compression testing diesel engines and recording compression readings
  - comparing the compression readings with specifications and identifying any deviations
  - adjusting firing pressures
  - starting, operating, loading and shutting down diesel engines
  - recording test results
  - determining exhaust smoke density and equipment and techniques
  - adjusting valve clearances and/or timing
  - adjusting injector pump and injector timing
  - adjusting the governor rack travel, torque spring load limit, over speed trips, aneroid or fuel ratio control
  - adjusting injector opening pressure
- appropriate adaptors and reasons for using adaptors

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- likely causes of any detected deviations from specification
- corrections required for compression readings to take account of the adaptor used
- test equipment and procedures to be used in the tuning of diesel engines
- manufacturer's recommended tests and reasons for conducting the tests
- timing and pressures to be achieved
- governor specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in tuning diesel engines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27006 Diagnose and rectify batteries, low voltage sensors and circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18030B Diagnose and rectify low voltage electrical systems

Application

This unit of competency defines the skills and knowledge required to use test instruments, test the battery, assess and rectify wiring faults.

It applies to testing and rectification activities associated with 12, 24 36 and 48 volt wiring systems on vehicles, mobile plant and stationary equipment.

Where soldering of wires/connections is required unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components should also be selected.

Where an electrical wiring system is above 48 volts unit MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply or unit MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c. should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Use test instruments**	2.1	Apply principles of electron theory, current, voltage and resistance to diagnose and rectify low voltage electrical systems
		2.2	Select, use and maintain appropriate test instruments to determine current, voltage and resistance
		2.3	Interpret electrical drawings and manufacturer diagrams
		2.4	Determine series, parallel and series parallel circuits
		2.5	Interpret and apply basic electrical laws
		2.6	Connect amps voltage and resistance (AVR) test instruments into circuits to measure current, voltage and resistance

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.7	Read meters to standard accuracy
		2.8	Use and apply multipliers and shunts
3	**Test battery**	3.1	Interpret and apply chemical battery operating principles when testing batteries
		3.2	Determine electrolyte level and record specific gravity readings temperature
		3.3	Carry out dry charge preparation and recharging of batteries
		3.4	Perform discharge testing according to prescribed procedures
		3.5	Select replacement batteries for application
4	**Assess and rectify wiring faults**	4.1	Isolate wiring and sensor fault
		4.2	Determine replacement sensors and cables/wires, including size and insulation quality
		4.3	Make up wiring looms for application and securely fix
		4.4	Strip, fit, prepare and terminate wiring and cables
		4.5	Test terminated cables for continuity and to comply with requirements
		4.6	Remove corrosion, neutralise and apply appropriate protective coating
		4.7	Test sensors, relays, solenoids, contacts and circuits and repair/replace

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Circuits include one (1) or more or the following for:	• door and other access locks • interior and exterior lighting • seat adjustment • power windows • turning and other indicators • low voltage electric motors • hazard and brake lights • sensors
Test instruments include the following:	• multimeters • amp meters • circuit testers
Wiring systems include the following:	• wiring • switching mechanisms • circuit protection devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18030B Diagnose and rectify low voltage electrical systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27006 Diagnose and rectify batteries, low voltage sensors and circuits

Modification History

Release 1. Supersedes and is equivalent to MEM18030B Diagnose and rectify low voltage electrical systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, SOPs, electrical drawings and diagrams to diagnose and rectify batteries, low voltage sensors and circuits
- selecting and using the correct test instrument, including multimeters, amp meters and circuit testers, for a variety of electrical circuits to measure current, voltage and resistance of specified circuit components or sections of circuitry
- applying Ohm's Law to determine the required values of current, voltage and resistance of a range of electrical circuits, including series, parallel and series parallel
- connecting electrical test instruments into given circuits to determine the required values of current, voltage and resistance in a safe and effective manner
- determining the specific gravity of the electrolyte for temperature variations using a hydrometer
- preparing dry batteries for charging and recharging and performing discharge testing of batteries
- fault finding using fault-finding techniques to identify wiring faults in electrical circuits
- selecting appropriate replacement cables according to size, rating and insulation resistance from supplier catalogues
- making up replacement wiring looms, stripping and preparing cable ends for termination and terminating to specifications
- testing terminations for continuity and compliance with requirements
- removing and/or neutralising corrosion from terminals and connections and applying appropriate protective coating
- testing and fault finding a range of circuits components, including sensors, relays, solenoids, contacts for repair/replacement.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of electron theory
- definitions of current, voltage and resistance in terms of electrical circuits
- Ohm's Law and the relationships between current, voltage and resistance for a variety of given electrical circuits
- instruments and procedures to be used to measure current, voltage and resistance and safety precautions to be taken
- procedures for maintaining electrical test equipment
- function of a variety of electrical circuits identified from given electrical drawings/diagrams
- symbols used in electrical drawings/diagrams
- components of a variety of electrical circuits identified by given electrical drawings/diagrams
- differences between series and parallel electrical circuits
- function of a general purpose oscilloscope and procedures for connecting a general purpose oscilloscope into given electrical circuits
- use of wave forms in the testing of electrical circuits
- accuracy to which a range of electrical test equipment can be read
- procedures for:
  - using multipliers and shunts in the measurement of electrical circuits
  - measuring the specific gravity of the electrolyte and the effect of temperature on the specific gravity of the electrolyte
  - preparing and recharging dry batteries
  - discharge testing of batteries and purpose
  - making up and fixing wiring looms can be given
  - stripping, fitting and preparing wiring terminations
  - soft and hard soldering/crimping of wiring terminations
  - corrosion removal and/or neutralisation
- operation of a chemical battery and the function of the electrolyte in batteries and specifications applied to batteries
- examples and causes of common faults in electrical wiring and test procedures for isolating wiring faults
- specifications of cables and wires, including insulation resistance used in given electrical circuits
- test procedures for terminated wiring and cables
- effect of corrosion on the performance of electrical circuits and connections
- coatings available to stop/inhibit corrosion
- correct operational principles of sensors, relays, solenoids and contacts
- common faults and causes in sensors, relays, solenoids, contacts and circuits and procedures for testing circuit components.

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Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying low voltage electrical systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27007 Diagnose and rectify low voltage starting systems

Modification History

Release 1. Supersedes and is equivalent to MEM18031B Diagnose and rectify low voltage starting systems

Application

This unit of competency defines the skills and knowledge required to assess the operation, test and repair starting systems requiring the use of amps, voltage and resistance (AVR) test equipment.

Where soldering of wires/connections is required unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess starting motor operation**	2.1	Apply principles of magnetism, induced voltage and electromagnetism and electric motor principles to assess starter motor operation
		2.2	Interpret starting motor component functions and multi-pole/winding/shunt wiring arrangements
		2.3	Test the performance of the cranking motor drive mechanism
		2.4	Determine starter locked armature current, voltage and torque
3	**Test and rectify starting motors**	3.1	Dismantle and assemble starting motors according to manufacturer recommendations
		3.2	Perform testing to determine shorts to ground, turn shorts and winding continuity
		3.3	Test solenoid, relays and over-temperature devices
		3.4	Test starter engagement mechanism and adjust where possible, i.e. pinion clearance
		3.5	Ensure starting system is free of excessive voltage drops
		3.6	Connect starting and charging cables to circuit

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	connections tighten and insulate
	3.7 Determine starter locked armature current, voltage and torque

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Axial and coaxial type starters with drive arrangements include one (1) or more of the following:	• Dyer • Positork • Sprag clutch • overrunning clutch • inertia drive

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18031B Diagnose and rectify low voltage starting systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27007 Diagnose and rectify low voltage starting systems

Modification History

Release 1. Supersedes and is equivalent to MEM18031B Diagnose and rectify low voltage starting systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings, diagrams and service documents to diagnose and rectify low voltage starting systems
- identifying the construction of electric starter motors
- testing the cranking motor drive mechanism
- dismantling and assembling given starter motors in accordance with manufacturer recommendations/procedures and specifications using appropriate tools, equipment and techniques
- checking operation of given starter motors for electrical faults, including testing solenoids, relays and over-temperature devices, operation and conformance of the engagement mechanism, excessive voltage drops and all circuit connections for compliance with specifications
- testing the repaired/overhauled starter motor to ensure that the locked armature current, voltage and torque for compliance to specifications.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- concepts of magnetism, electromagnetism and induced voltage
- principles of operation of electric motors
- components and functions of common starting motors
- effect of multi-pole/winding/shunt wiring arrangements on starting motor performance
- tests and test procedures that can be used to check the performance of the cranking motor drive mechanism
- concept of 'locked armature' in terms of current, voltage and torque and specifications
- tools and equipment used to test components and systems
- procedures for:

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  - determining locked armature current, voltage and torque
  - testing solenoids, relays and over-temperature devices for correct operation and operational specifications
  - testing and adjusting starter engagement mechanisms and specifications
  - checking starting systems for excessive voltage drops
- manufacturers' recommended dismantling/assembling procedures, tools and equipment for given starting motors
- range of electrical tests that can be applied to starting motors and the purpose of these tests
- equipment and procedures required to carry out the tests
- function of solenoids, relays and over-temperature devices
- effect and causes of voltage drops on starting system operation/performance
- effect of loose, poorly joined and/or inappropriate insulation on starting motor performance/operation and specifications of all circuit connections.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying low voltage starting systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27008 Maintain induction, exhaust and emission control systems

Modification History

Release 1. Supersedes but not equivalent to MEM18032B Maintain induction/exhaust systems

Application

This unit of competency defines the skills and knowledge required to assess induction, exhaust and emission control system operation and repair or replace faulty components.

It applies to induction and exhaust systems on mobile and stationary plant and equipment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess induction and exhaust system operation**	2.1	Apply principles, terminology and applications of supercharging, filtering, inter and after cooling to assess induction and exhaust system operation
		2.2	Obtain relevant information and interpret prior to any testing
		2.3	Undertake checks safely and to prescribed testing procedures
		2.4	Determine and record flows, pressures and temperatures
		2.5	Isolate faults to component level and determine appropriate corrective action using appropriate test instruments and equipment
3	**Assess emission control system operation**	3.1	Inspect emission control system components against manufacturer specification
		3.2	Check fuel evaporative control system and engine crankcase ventilation
		3.3	Service, adjust or replace components to manufacturer specifications, workplace procedures and WHS and environmental requirements

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
4 **Rectify faulty components**	4.1 Determine component wear and clearances using manufacturer recommendations
	4.2 Determine if faulty components should be repaired or replaced
	4.3 Repair faulty components where appropriate
	4.4 Select replacement components using manufacturers' data
	4.5 Remove and refit repaired or replacement components to engine
	4.6 Record all test and rectification activities
	4.7 Ensure engine is free of air and exhaust leaks after repair work is carried out

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Faults include one (1) or more of the following:

- excessive air inlet restrictions
- excessive exhaust back pressures
- too much or too little boost pressure
- ineffective inter or after cooling

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Unit Mapping Information

Release 1. Supersedes but not equivalent to MEM18032B Maintain induction/exhaust systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27008 Maintain induction, exhaust and emission control systems

Modification History

Release 1. Supersedes but not equivalent to MEM18032B Maintain induction/exhaust systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents to maintain induction and exhaust systems
- checking induction and exhaust system for correct operation
- checking emission control system performance for correct operation against specifications
- using test instruments and equipment to isolate faults down to component level and visually and dimensionally checking components for wear against specifications
- undertaking calculations and numerical operations to maintain induction and exhaust systems
- removing and refitting components to engines, including using replacement parts from manufacturers' catalogues
- checking induction/exhaust system for leaks
- using appropriate tools, equipment and techniques for each task
- recording all test and repair activities in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles and terminology of supercharging, filtering, inter and after cooling
- performance and operational specifications of the induction and exhaust system
- procedures and safety precautions for testing induction/exhaust systems for correct operation
- equipment and procedures necessary to test flows, pressures and temperatures associated with induction/exhaust systems
- components and applications of supercharging apparatus
- maintain induction, exhaust and emission control systems

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- types of emissions, their relationship to standards and specifications and their effects on the environment
- sources of emissions from mobile and stationary plant and equipment
- exhaust gas recirculation (EGR) systems
- supplementary catalytic reduction (SCR) systems
- role of particulate filters, charcoal canisters, fuel evaporative control systems and crankcase ventilation in controlling emissions
- supercharging apparatus such as turbo charging equipment
- common faults associated with induction/exhaust systems and causes of those faults
- appropriate action and procedures for correcting common faults in induction/exhaust systems
- component specifications/tolerances and actions to be taken if the components are outside of specification
- action to be taken if the components are 'just' within specification
- measuring instruments to be used to carry out dimensional checks on components
- the operation of the apparatus installed to balance fuel injection to boost pressure and control devices installed to prevent excessive turbocharger RPM and/or boost pressure
- procedures and safety precautions for removing/fitting components to engines
- procedures for recording test and repair activities undertaken on induction/exhaust systems
- consequences of air/exhaust leaks on the safe operation of the induction/exhaust system and procedures for testing for leaks in induction/exhaust systems.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining induction/ exhaust systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27009 Diagnose and rectify braking systems

Modification History

Release 1. Supersedes and is equivalent to MEM18035B Diagnose and rectify braking systems

Application

This unit of competency defines the skills and knowledge required to check and assess braking systems, and replace/repair/overhaul braking system components associated with mobile equipment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check and assess braking system**	2.1	Identify braking system types, components and arrangements, including anti-lock systems
		2.2	Apply knowledge of friction and heat principles and component functions to check and assess braking system operation
		2.3	Assess braking system, including control devices, for compliance with relevant specifications, regulations and standards
		2.4	Assess serviceability of friction materials, discs and drums
		2.5	Assess braking system communication and control modules and bus connections for correct operation and compliance with specifications
		2.6	Measure and record minimum operating dimensions and determine corrective action
		2.7	Diagnose faults to component level and determine appropriate corrective action
3	**Rectify and overhaul braking system components**	3.1	Interpret characteristics of surface finishes and wear patterns associated with braking components
		3.2	Interpret measurements and part condition when determining reuse/replacement
		3.3	Remove braking system components and disassemble

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Clean components using appropriate fluid and procedure
	3.5 Adjust friction material to reaction member clearance to specification
	3.6 Ensure system is free of leaks/restrictions after repair work
	3.7 Adjust all levers, linkages and pedal clearances to specifications
	3.8 Recommission and test braking system according to manufacturer recommendations or appropriate standard/regulation

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Braking system arrangements include one (1) or more of the following:	• air • hydraulic • air over hydraulics • mechanical • electric • disc • multi-wet disc • drum • wheel brakes • track brakes • anti-locking braking systems • transmission brakes and service • park and emergency brakes
Braking system control devices include one (1) or more of the following:	• communication and control circuit cabling and connectors • bus systems • data logger connections for braking system • power circuits and connectors for modules
Relevant regulations/standards include one (1) or more of the following:	• Australian Design Rules • mines regulations • transport regulations

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18035B Diagnose and rectify braking systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27009 Diagnose and rectify braking systems

Modification History

Release 1. Supersedes and is equivalent to MEM18035B Diagnose and rectify braking systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices, including brake dust, fibre and fluid control and protection procedures
- identifying and interpreting specifications, charts, lists, drawings and service documents to diagnose and rectify braking systems
- checking braking system for conformance to specifications and for compliance with relevant regulations
- checking friction materials and identifying as being serviceable or to be replaced
- undertaking calculations and numerical operations for diagnosing and rectifying braking systems
- measuring and recording brake operating dimensions and identifying variations of brake operating measurement from specifications
- checking operation of braking system for compliance to specifications and identifying faulty components for replacement
- checking braking system interaction with equipment control and recording systems and components
- removing, dismantling, handling and replacing braking system components safely
- cleaning components using appropriate solutions and safety precautions
- adjusting brake clearance, levers, linkages and pedal clearances using appropriate tools, equipment and procedures
- testing and recommissioning the braking system for compliance with specifications/regulations.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of friction and heat as applied to braking systems
- function of the components of a variety of braking system types and arrangements
- typical applications of different types of braking systems

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- requirements of relevant regulations as applying to mobile plant braking systems
- tools, techniques and equipment used to remove and dismantle braking system components
- procedures for:
  - checking braking systems for compliance with regulations
  - measuring brake operating dimensions recording brake operating dimensions
  - checking braking system operation
  - removing and dismantling braking system components
  - cleaning braking system components and solutions to be applied
  - adjusting brake clearances, levers, linkages and pedal clearances
  - checking for hydraulic, air and vacuum system leaks and restrictions
  - testing and recommissioning the braking system
- worn and defective friction materials
- specifications of the braking system
- corrective action to be taken when brake operating measurement varies from specification
- corrective action to be taken when faulty braking system components are identified
- characteristics of surface finishes and wear patterns as applied to braking system components
- reasons for identifying the components for reuse or replacement
- precautions to be taken when handling braking systems components
- reasons for selecting the chosen tools, techniques and equipment
- tests, tools, techniques and equipment required to test the braking system and reasons for selection.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying braking systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27010 Diagnose and rectify low voltage charging systems

Modification History

Release 1. Supersedes and is equivalent to MEM18037B Diagnose and rectify low voltage charging systems

Application

This unit of competency defines the skills and knowledge required to assess generator/alternator operation, and test and repair and/or replace generators and alternators.

It applies to the testing and rectification work associated with 12, 14, 36 and 48 volt charging systems on vehicles, mobile plant and stationary equipment.

Where specialist electronic skills are required appropriate units should also be selected.

Where soldering of wires/connections is required unit MEM05001 Perform manual soldering/desoldering - electrical/electronic components should also be selected.

Where an electrical wiring system is above 48 volts unit MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply or unit MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c. should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits

Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess generator/ alternator operation**	2.1	Apply principles of magnetism, induced voltage and electromagnetism when assessing generator/alternator operation
		2.2	Apply alternating and direct current generating principles, voltage/current regulation methods and types and action of diodes/condensers in generator/alternator operation to assess generator/alternator operation
		2.3	Check charging system performance and record variances from system specifications
3	**Test and rectify generators/**	3.1	Dismantle and assemble generators/alternators to specifications

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
alternators	3.2 Determine charging faults to component level
	3.3 Perform testing to determine shorts to ground, turn shorts and winding continuity
	3.4 Test alternator/generator for normal and maximum output
	3.5 Test voltage and/or current regulators and cut-outs and relays and adjust to specification
	3.6 Determine condition of power/exciter diodes
	3.7 Replace all faulty components according to manufacturers' recommendations
	3.8 Ensure charging system is free of excessive voltage drops and connections are soldered, tightened and insulated

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Faulty components include one (1) or more of the following:	• brush gear • bearings • diodes • contacts • relays

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18037B Diagnose and rectify low voltage charging systems

Links

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Assessment Requirements for MEM27010 Diagnose and rectify low voltage charging systems

Modification History

Release 1. Supersedes and is equivalent to MEM18037B Diagnose and rectify low voltage charging systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents to diagnose and rectify low voltage charging systems
- checking and testing the charging system for correct operation and conformance and recording any variations from system specifications
- dismantling/reassembling given generators and alternators using appropriate tooling, techniques and procedures and replacing faulty components
- identifying charging faults and conducting tests for short circuit and winding continuity tests
- undertaking calculations and numerical operations in diagnosing and rectifying low voltage charging systems
- testing current and voltage regulators, cut-outs and relays for correct operation and determining the condition of given power/exciter diodes to specifications
- testing the output of the generator/alternator for compliance to specifications, including the charging system for excessive voltage drops
- recording/reporting all service activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- concepts of magnetism, electromagnetism and induced voltage
- construction and principles of operation of generators and alternators
- methods of generating alternating and direct current for low voltage systems
- methods of regulating voltage and current generated
- function of diode and condenser types of regulator
- tests and test procedures that can be used to check the performance of the charging system

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- charging system specifications and procedures for recording charging system performance/variations from specifications
- procedures for:
  - dismantling and reassembling generators/alternators and tools and equipment to be used
  - identifying charging faults, testing short circuits and winding continuity and test equipment to be used
  - testing and methods of adjusting voltage and current regulators, cut-outs and relays
  - testing diodes with the appropriate test equipment and precautions to be taken
- specifications of generator/alternator output and test equipment and procedures to be used to determine alternator/generator output
- operational specifications and test equipment to be used to check the operation of voltage and current regulators, cut-outs and relays
- components of generators/alternators that can be replaced
- specifications of the faulty generator/alternator components
- effect and causes of voltage drops on charging system operation/ performance and procedures to be taken when checking for excessive voltage drops
- effect of loose, poorly soldered and/or inappropriate insulation on charging system operation
- parameters which determine repair or replacement
- specifications of all circuit connections.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying low voltage charging systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27011 Maintain track type undercarriage on mobile plant

Modification History

Release 1. Supersedes and is equivalent to MEM18039B Diagnose and rectify track type undercarriage

Application

This unit of competency defines the skills and knowledge required to maintain track assemblies, including checking components, clearances, tension and replacing any faulty components.

It covers mobile plant equipment that uses crawler belts and/or chain links.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess track assembly**	2.1	Apply operating principles and terminology of track type undercarriage in assessing track assembly
		2.2	Inspect for wear or damage and determine if component requires repair or replacement
		2.3	Check track frame alignment and determine variances from specifications
3	**Rectify and maintain track assemblies**	3.1	Remove, repair or replace faulty track undercarriage components
		3.2	Set track tension to specification
		3.3	Adjust clearances to specification
		3.4	Record all service/rectification activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:

- links
- pins
- sprockets
- idlers
- rollers and pads
- track chains
- tensioners
- sensors and monitoring module

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18039B Diagnose and rectify track type undercarriage

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27011 Maintain track type undercarriage on mobile plant

Modification History

Release 1. Supersedes and is equivalent to MEM18039B Diagnose and rectify track type undercarriage

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to diagnose and rectify track type undercarriage
- checking track type undercarriage for compliance with specifications
- identifying components present in the track type undercarriage system
- inspecting track type undercarriage components for wear and damage and identifying worn or damaged parts for repair or replacement using appropriate tools, equipment and techniques
- undertaking calculations and numerical operations associated with diagnosing and rectifying track type undercarriage
- checking the track frame for alignment and identifying variations from alignment specifications
- removing and replacing track undercarriage components using appropriate tools, equipment and techniques
- setting track tension and adjusting clearances to specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operating principles of track type undercarriage
- procedures for:
  - checking track type undercarriage components for wear and tools, techniques and equipment
  - aligning track frames and tools, techniques and equipment
  - removing and replacing track type undercarriage components and precautions to be taken

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  - setting track tension and adjusting clearances setting track tension and adjusting clearances
- reasons for selecting the chosen tools, techniques and equipment
- specifications of the track type undercarriage components
- action to be taken to overcome the wear and/or damage detected.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining track type undercarriage on mobile plant at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27012 Maintain mobile plant suspension systems

Modification History

Release 1. Supersedes and is equivalent to MEM18040B Maintain suspension systems

Application

This unit of competency defines the skills and knowledge required to assess, maintain and repair/replace suspension systems of all types of wheeled and/or tracked plant/vehicles.

Where suspension systems are required to be maintained on track type undercarriage see unit MEM27014 Diagnose and rectify automatic transmissions.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess suspension systems**	2.1	Apply principles of operation and terminology to alignment and suspension systems
		2.2	Assess components for security, wear and faults and determine corrective action
		2.3	Assess component parts and determine the need for repair or replacement
		2.4	Test suspension arrangements, control arms/links, dampening and control devices for correct operation
		2.5	Assess axle alignment/tracking and determine variance from specification
		2.6	Test auto/manual levelling devices for performance to specifications
3	**Maintain suspension systems**	3.1	Align axles to specification
		3.2	Adjust ride height to specification
		3.3	Re-gas suspension system to specification
		3.4	Remove/replace suspension components using appropriate tools, equipment and techniques
		3.5	Record all service and rectification activities

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18040B Maintain suspension systems

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27012 Maintain mobile plant suspension systems

Modification History

Release 1. Supersedes and is equivalent to MEM18040B Maintain suspension systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to maintain suspension systems
- inspecting the suspension components for wear, faults and security
- testing suspension arrangements, control arms/links and dampening devices for correct operation
- checking axle alignment/tracking for compliance with specifications and identifying variations of axle alignment from specification
- undertaking calculations and numerical operations associated with maintaining suspension systems
- testing automatic/manual levelling devices for correct operation
- aligning axles, adjusting the ride height and re-gassing the suspension system to specifications
- removing/replacing suspension components using appropriate tools, equipment and techniques
- recording/reporting all service and rectification work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operation of suspension systems and the effects of steering geometry and alignment
- procedures for:
  - checking suspension system components for wear, faults, security and conformance to specification and tools, techniques and equipment
  - aligning axles and specifications that apply
  - adjusting ride height and specifications that apply
  - re-gassing suspension systems and precautions to be taken

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    - removing and replacing suspension systems and precautions to be taken
- parameter determining suitability of repair or replacement of components and component parts
- action to be taken to correct non-conformance to specification
- tools, techniques and equipment required to maintain and repair suspension systems and reasons for selection.

Assessment Conditions

- Assessors must:
    - have vocational competency in maintaining suspension systems at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27013 Maintain steering systems

Modification History

Release 1. Supersedes and is equivalent to MEM18041B Maintain steering systems

Application

This unit of competency defines the skills and knowledge required to assess steering system operation, and repair or replace faulty components on steering systems for vehicles, mobile plant and equipment.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and mobile plant

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess steering system operation**	2.1	Obtain relevant information and interpret prior to any testing
		2.2	Undertake performance tests on primary and/or emergency steering systems in accordance with prescribed procedures
		2.3	Determine and record flows and pressures angles using appropriate test equipment
		2.4	Identify available wheel and axle adjustments and specifications
		2.5	Isolate faults to component level and determine appropriate corrective action
		2.6	Repair or replace faulty components and component parts
		2.7	Apply power steering component functions, adjustment principles, terminology and applications when assessing steering system operation
3	**Repair/replace faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Select replacement components using manufacturers' data
		3.3	Remove components and refit using appropriate tools, equipment and techniques

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Undertake wheel and axle adjustments to comply with alignment specifications
	3.5 Make adjustments to primary and/or emergency steering systems that makes the system compliant with specifications
	3.6 Record all test and rectification activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Steering system includes one (1) or more of the following:	• manual
	• hydraulically assisted
	• full hydraulic
	• articulated and track type systems, including:
	  • hydrostatic
	  • clutch and differential steering

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18041B Maintain steering systems

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Links

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Assessment Requirements for MEM27013 Maintain steering systems

Modification History

Release 1. Supersedes and is equivalent to MEM18041B Maintain steering systems

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to maintain steering systems
- checking and testing steering system for compliance to specifications using appropriate tools, test equipment and techniques
- recording all test results and measurements in accordance with SOPs
- measuring steering system components using appropriate tools, equipment and techniques
- undertaking calculations and numerical operations associated with maintaining steering systems
- removing/refitting steering system components and selecting replacement parts using manufacturer catalogues and data
- aligning wheels and axles and adjusting steering system to specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- operation of the steering system and its components
- procedures for:
  - testing steering system performance and tests to be undertaken
  - checking components for wear and clearance
  - removing and refitting steering system components and precautions to be taken
  - adjusting the alignment of wheels and axles if available on the equipment
  - recording test and rectification activities
  - adjusting primary and emergency steering systems and the effect this causes on the steering system specifications

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- tools, techniques and equipment necessary to maintain and rectify steering systems and reasons for selection
- precautions to be taken when testing steering systems and procedures for recording test results
- identification of faulty components and reasons for the corrective action to be taken
- parameter determining suitability of repair or replacement of components and component parts
- operation of power and power assisted steering systems
- effects of toe in and other available wheel/axle alignments on steering system operation
- measuring equipment to be used.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining steering systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27014 Diagnose and rectify automatic transmissions

Modification History

Release 1. Supersedes and is equivalent to MEM18043C Diagnose and rectify automatic transmissions

Application

This unit of competency defines the skills and knowledge required to assess converter/transmission operation, and repair or replace faulty components.

Testing and assessment of performance would typically require operation of the plant or equipment. A licence may be required and users should check with the relevant authorities.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess converter/ transmission operation**	2.1	Apply principles of torque converter, simple and compound planetary gearing, and hydraulic control operating principles to assess converter/transmission operation
		2.2	Obtain and interpret relevant information prior to any testing
		2.3	Undertake preliminary checks safely to prescribed procedures
		2.4	Isolate faults to component level and determine appropriate corrective action
		2.5	Assess component parts and determine the need for repair or replacement
		2.6	Use test equipment in accordance with SOPs
		2.7	Assess component parts for reuse or replacement
3	**Repair/replace faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Select replacement components using manufacturers' data

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.3 Remove and refit components to converter/transmission assembly using appropriate tools, equipment and techniques
	3.4 Make adjustments using appropriate tooling/equipment and manufacturers' data
	3.5 Verify converter/transmission assembly is free of excessive noise and operates to specification after repair work is carried out
	3.6 Record all test and rectification activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Automatic transmissions and assemblies include one (1) or more of the following:	• automatic • semi-automatic • powershift transmissions • hydrostatic transmissions • fluid coupling/torque converter assemblies • continuously variable transmission (CVT)
Control of lockup/shifting includes one (1) or more of the following:	• fully hydraulic • electronic

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18043C Diagnose and rectify automatic transmissions

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27014 Diagnose and rectify automatic transmissions

Modification History

Release 1. Supersedes and is equivalent to MEM18043C Diagnose and rectify automatic transmissions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions using different types of automatic transmissions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings, design rules and other applicable reference documents to diagnose and rectify automatic transmissions
- checking automatic transmission for compliance with specifications using appropriate tools, techniques and test equipment
- undertaking calculation and numerical operations associated with diagnosing and rectifying automatic transmissions
- selecting and using appropriate test equipment to test converter/transmission components for compliance to specifications
- interpreting fault codes and data from test equipment and control modules
- identifying faulty components by using appropriate testing equipment and identifying components for reuse or replacement
- removing and refitting components to converter/transmission assembly and selecting replacement parts using manufacturers' catalogues and data
- adjusting converter/transmission components using appropriate tools, techniques and equipment
- operating the converter/transmission assembly free of excessive noise and in compliance with specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of operation of automatic transmissions
- parameter determining suitability of repair or replacement of components and component parts

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- function of torque converters, countershaft transmissions, planetary gearing, control valves and solenoids and hydraulic controls in automatic transmissions
- procedures for:
  - checking automatic transmissions for correct operation
  - testing automatic transmissions
  - checking automatic transmission components for wear and clearance
  - removing, refitting and adjusting automatic transmission components
  - recording test and rectification activities
- appropriate action to correct the faulty components
- test equipment to be used in checking/testing automatic transmissions for correct operation and reasons for selection
- tools, techniques and equipment to be used to determine component wear and clearance and reasons for selection
- tools, techniques and equipment to be used to maintain and repair automatic transmission assemblies
- effects of the adjustments on automatic transmission operation
- automatic transmission assembly specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying automatic transmissions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27015 Diagnose and rectify drive line and final drives

Modification History

Release 1. Supersedes and is equivalent to MEM18044C Diagnose and rectify drive line and final drives

Application

This unit of competency defines the skills and knowledge required to assess drive line and final drive operation, and repair or replace faulty components.

Testing and assessment of performance would typically require operation of plant and equipment. A licence may be required and users should check with the relevant authorities.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess drive line and final drive operation**	2.1	Apply operating principles of universal and constant velocity joints, conventional/limited slip and locking, differential action and reduction systems, and conventional/swing axle to assess operation of the drive line and final drive assemblies
		2.2	Obtain and interpret relevant information prior to any testing
		2.3	Undertake preliminary checks safely to prescribed procedures
		2.4	Isolate faults to component level and determine appropriate corrective action
		2.5	Use test equipment in accordance with SOPs
		2.6	Assess component parts for reuse, repair or replacement
3	**Repair/replace faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Select replacement components using manufacturers' data
		3.3	Remove and refit components to driveline and final drive assemblies using appropriate tools, equipment and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	techniques
	3.4 Make adjustments using appropriate tooling/equipment and manufacturers' data
	3.5 Verify drive line and final drive assemblies are free of excessive noise and operate to specification after work is carried out
	3.6 Record all test and repair/replacement activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Test and rectification activities are associated with one (1) or more of the following used in conventional and all-wheel drive equipment:	• wheeled plant/vehicles • tracked plant/vehicles • drive line assemblies • final drive assemblies
Reduction systems include one (1) or more of the following:	• single reduction carrier • double reduction carrier • hub reduction

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18044C Diagnose and rectify drive line and final drives

Links

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Assessment Requirements for MEM27015 Diagnose and rectify drive line and final drives

Modification History

Release 1. Supersedes and is equivalent to MEM18044C Diagnose and rectify drive line and final drives

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and service documents to diagnose and rectify drive lines and final drives
- checking drive line and final drive for compliance with specifications using appropriate tools, techniques and test equipment
- undertaking calculation and numerical operations associated with diagnosing and rectifying drive lines and final drives
- testing the drive line and final drive components for conformance to specifications and identifying faulty components by using appropriate testing equipment and identifying components for reuse or replacement
- removing and refitting components to drive line and final drive assemblies and selecting replacement parts using manufacturer catalogues and data
- adjusting drive line and final drive components using appropriate tools, techniques and equipment
- operating the drive line and final drive assembly free of excessive noise and in compliance with specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of operation of drive lines and final drives
- functions of universal and constant velocity joints, differentials and axles
- procedures for:
  - checking drive lines and final drives for correct operation
  - testing drive lines and final drives
  - checking drive line and final drive components for wear and clearance

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  - removing, refitting and adjusting drive line and final drive components
  - recording test and work activities
- faulty drive line and final drive components and appropriate action to correct the faulty components
- test equipment to be used in checking/testing drive lines and final drives for correct operation
- component parts for reuse or replacement
- tools, techniques and equipment to be used to determine component wear and clearance
- replacement components using manufacturers' data
- tools, techniques and equipment to be used to maintain and repair drive line and final drive assemblies
- effects of the adjustments on drive line and final drive operation
- drive line and final drive assembly specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying drive line and final drives at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27016 Diagnose and maintain electronic controlling systems on mobile and stationary plant

Modification History

Release 1. Supersedes and is equivalent to MEM18047B Diagnose and maintain electronic controlling systems on mobile plant

Application

This unit of competency defines the skills and knowledge required to test, diagnose and fault find electronic control systems associated with mobile and stationary plant and equipment.

It applies to whole of equipment diagnosis and rectification and complements diagnostic and rectification skills contained in individual system units of competency.

Where electronic systems associated with communication between the mobile or stationary plant and external communication sources such as those used for remote guidance or monitoring unit MEM27018 Test, diagnose and rectify mobile and stationary plant external monitoring and control systems should also be selected.

Where the repair of electronic circuitry associated with these systems. is required unit MEM18056 Diagnose and repair analog equipment and components and unit MEM18057 Maintain/service analog/digital electronic equipment, should also be selected as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits
MEM27023	Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment

Competency Field

Fixed and mobile plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Prepare for service or maintenance task**	2.1	Check service and operational records and discuss operational history with operator where relevant
		2.2	Identify control and bus systems used in mobile or stationary plant and locate control units and modules
		2.3	Inspect plant for obvious damage or wear to control units, modules or circuits
		2.4	Identify and select diagnostic benchmarks, methods, sequence, tests and testing processes according to manufacturer specification and workplace requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
3	**Perform diagnostic tests on electronic controlling systems**	3.1	Operate plant or equipment and undertake visual, aural and functional checks for obvious faults, including checking for warning gauges, lights and alerts
		3.2	Access and interpret fault codes, live data and freeze frame data using appropriate test procedures and equipment and precautions to safeguard electronic components and systems
		3.3	Interpret fault codes and other diagnostic test results to determine controlling systems requiring rectification
		3.4	Trace faults from fault codes using specified troubleshooting procedures
		3.5	Determine if fault is related to wiring, interference, components, modules or individual system controller
		3.6	Determine root cause of faults
4	**Rectify faulty electronic controlling systems**	4.1	Rectify faults through repair, replacement or reprogramming to required specification
		4.2	Clear fault codes from memory according to SOPs
		4.3	Test controlling system and components for correct operation
		4.4	Make adjustments, as required, to mechanical clearances and measured electrical and resistance values
5	**Change operating parameters**	5.1	Source appropriate specifications from plant/equipment identification and applicable manuals and specifications
		5.2	Select and use appropriate tooling (software/hardware)
		5.3	Obtain relevant security codes using plant/equipment identification
		5.4	Download, enter and verify data for new specifications

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Plant and equipment systems include one (1) or more of the following:	• discrete logic • analogue monitoring • microprocessor monitoring • control systems

Maintenance includes one (1) or more of the following:	• wiring harness faults
	• testing and identifying faulty:
	  • sensors
	  • actuators
	  • control components
	• replacing and making adjustments to:
	  • input components
	  • output components
	• accessing data from electronic control unit and applicable manufacturer software/hardware to change operating parameters

Input components include one (1) or more of the following:	• sensors • actuators • resistors • capacitors • diodes • transistors • integrated circuits (ICs) • erasable programmable read-only memory (EPROM) • microprocessors • joysticks

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Output components include one (1) or more of the following:	• hardware • software • hard copy devices • soft storage devices

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18047B Diagnose and maintain electronic controlling systems on mobile plant

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27016 Diagnose and maintain electronic controlling systems on mobile and stationary plant

Modification History

Release 1. Supersedes and is equivalent to MEM18047B Diagnose and maintain electronic controlling systems on mobile plant

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, manufacture/technical manuals and other applicable reference documents to diagnose and maintain electronic controlling systems on mobile plant
- identifying applicable control unit and using fault codes correctly to access fault codes with indicators, meters or diagnostic tooling then clearing codes from memory and verifying using applicable procedures and manuals
- tracing the root cause of faults
- identifying and applying procedures to safeguard electronic components and systems when diagnosing and maintaining typical mobile electronic circuits
- locating, identifying and testing applicable input and output components
- repairing/replacing components and selecting replacement parts using manufacturer specifications and data
- adjusting mechanical clearances and measured electrical and resistance values using appropriate tools and techniques
- obtaining security codes using correct protocol from manufacturer, plant/equipment identification and using computer and relevant computer applications to download, enter and verify new specifications in accordance with manufacturer procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- applicable fault codes and their meanings and procedures to clear fault codes and verify clearance
- sources of potential damage to typical mobile plant electronic systems when performing maintenance and diagnostic work and techniques and procedures to safeguard against damage

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- correct troubleshooting procedures, including identifying root causes of faults, including faults related to:
  - design
  - manufacturing
  - operator error (e.g. overload and over speed)
  - environment (e.g. contamination, interference and hazards)
  - previous service or maintenance error
- procedures for:
  - removal and replacement of faulty components and techniques and procedures
  - obtaining security code
  - downloading, entering and verifying data
- various types of input components
- operation and principles of transducers used in control systems
- relevant testing procedures
- component types, functions and locations
- techniques for repairing components
- operation and principles of actuators used in control system
- concepts of erasable programmable read-only memory (EPROM) and microprocessors.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and maintaining electronic controlling systems on mobile plant at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27017 Maintain, fault find and rectify hydraulic systems for mobile plant

Modification History

Release 1. Supersedes and is equivalent to MEM18052B Maintain fluid power systems for mobile plant

Application

This unit of competency defines the skills and knowledge required to test, fault find and rectify hydraulic systems used in the earthmoving, agricultural and transport industries.

It covers identifying the hydraulic system and components used on mobile plant, general servicing and identifying faults that are related to electronic and fieldbus controls and communication.

Where the rectification of electronic controls is required unit MEM27016 Diagnose and maintain electronic controlling systems on mobile and stationary plant should also be selected.

Where the rectification of communication systems is required unit MEM27018 test, diagnose and rectify mobile and stationary plant external monitoring and control systems should also be selected.

Where the rectification of fieldbus controls is required unit MEM27023 Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling

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MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Secure system from potentially hazardous situations**	2.1	Identify sources of stored energy and assess mobile plant for potentially hazardous situations and conditions
		2.2	Bleed down accumulators and position actuators to remove stored energy in accordance with manufacturer instructions
3	**Identify equipment hydraulic systems and relevant**	3.1	Check specifications and drawings for mobile equipment systems, actuators and accessories dependent on hydraulic power
		3.2	Identify control modules and fieldbus wiring locations

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	operational data		for hydraulic systems
		3.3	Consult equipment operator where appropriate and collect additional data on equipment performance and faults
		3.4	Check previous maintenance reports and preventative maintenance schedules and review for additional fault-finding data
4	**Check hydraulic system components and fluid**	4.1	Identify system components using appropriate circuit diagrams or manufacturer instructions
		4.2	Inspect equipment for obvious faults, leaks and contamination
		4.3	Access, inspect and test the operational function of components in accordance with SOPs
		4.4	Trace and localise faults with reference to manufacturer troubleshooting procedures, including using accessing and interpreting fault codes in controllers
		4.5	Determine parts that require repair or replacement
		4.6	Check hydraulic fluid and components for signs of contamination
5	**Rectify component faults**	5.1	Remove faulty components from system using appropriate tools, procedures and techniques
		5.2	Source replacement components from manufacturer/supplier
		5.3	Prepare and assemble hoses, tubes and pipework
		5.4	Assemble and refit replacement components and conductors to system
		5.5	Replace filter or fluid where required
		5.6	Test and adjust system for correct operation according to SOPs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
6	**Dismantle, inspect and rectify linear actuators**	6.1	Dismantle hydraulic cylinders and rams using appropriate tools, procedures and techniques
		6.2	Evaluate component parts for condition
		6.3	Fit seals and bearings in accordance with manufacturer specifications
		6.4	Reassemble and fit cylinders/rams in accordance with manufacturer instructions
		6.5	Test assembly in accordance with manufacturer instructions
7	**Complete maintenance and fault rectification work**	7.1	Perform scheduled preventive maintenance and other hydraulic systems servicing according to manufacturer schedules and instructions
		7.2	Verify correct operation of the system using fluid power principles and manufacturer instructions
		7.3	Instigate appropriate follow-up procedures
		7.4	Update maintenance and service records

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

General servicing includes the following:

- fluid replacement
- filtration requirements
- oil sampling
- checking for and rectifying faults
- preventative maintenance
- checks and adjustments to suit changes in operating conditions

Hydraulic systems include the following:

- open circuit
- closed circuit
- systems used for one (1) or more of the following:
  - direct motive power
  - powering actuators
  - braking
  - transmissions and gearboxes
  - pumping

Contaminants include one (1) or more of the following:

- dirt
- metal particles
- other particulates
- water
- fuel
- non-hydraulic oil

Rectifying includes the following:

- replacement of components and fittings
- filtering or replacement of hydraulic fluid
- assembly and fitting of hydraulic hoses
- flushing/cleaning of tubing and pipework
- resealing and repairs to cylinders and rams
- resetting of controls

Checks include one (1) or more of the following:

- pressure and flow testing
- cycle times
- basic interrogation of diagnostic system controllers
- basic electronic servicing

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Components include one (1) or more of the following:	• actuators • fixed and variable displacement pumps • pressure, directional and flow control valves • electro-hydraulic servo and servo-proportional valve (EHSV) • hydraulic motors • reservoirs • contamination control components (filtration) • fluid conductors/fittings • other associated equipment

Service of hydraulic systems include the following:	• change out of hydraulic components, including:
	  • pumps
	  • valves
	  • actuators
	• the associated remedial actions required, including:
	  • system flushing and purging
	  • setting of component parameters

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18052B Maintain fluid power systems for mobile plant

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27017 Maintain, fault find and rectify hydraulic systems for mobile plant

Modification History

Release 1. Supersedes and is equivalent to MEM18052B Maintain fluid power systems for mobile plant

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to maintain hydraulic systems on mobile plant
- identifying sources of stored energy and hazardous situations/conditions, including bleeding down accumulators and position actuators, and applying appropriate safety measures
- fault finding hydraulic system down to component level using appropriate fluid power principles and procedures
- inspecting and testing components using appropriate equipment in accordance with procedures
- identifying and tracing fieldbus circuits and control modules related to hydraulic systems on equipment
- removing/refitting faulty components to system, including pipes, hoses, conductors and fittings and where appropriate cutting and assembling conductors to length using appropriate tooling/machine, techniques and procedures
- undertaking calculation and numerical operations associated with maintaining fluid power systems on mobile plant
- testing and adjusting replacement components for correct operation and compliance to specifications
- dismantling linear actuators without damage using appropriate tools, techniques/procedures and safety measures and using specifications to identify performance/condition of cylinders and rams for wear and damage
- fitting seals and bearings and reassembling cylinder/ram in accordance with manufacturer instructions
- refitting and testing assembly to machine and verifying repairs on machine circuit and/or test rig to specifications
- carrying out general servicing of hydraulic system in accordance with manufacturer instructions
- recording/reporting service activities in accordance with SOPs.

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Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- different sources of stored energy and their applications and reasons for bleeding accumulators and actuators and the hazards associated with working on pressurised systems
- open circuit hydraulic systems, including:
  - applications
  - fixed displacement pump systems, including simple Open centre DCV systems and closed centre with bypass (3 port) compensator inlet
  - variable displacement pump systems, including pre and post-compensated systems
  - open centre systems
  - pump control systems, including proportional displacement control for open circuit pumps
  - common faults and preventative maintenance
- closed circuit systems, including:
  - applications
  - simple fixed/variable pumps with manual control
  - common faults and preventative maintenance
- full range of hydraulic system components in a mobile plant application
- information on circuit diagram or manufacturer instructions
- characteristics and operational function of each system component
- impact of other equipment systems on the hydraulic system
- methods and techniques for tracing and localising faults and problems and reasons relating to faulty hydraulic system components/ operation in accordance with specifications
- procedures for:
  - inspecting and testing hydraulic system components and equipment to be used
  - checking and adjusting the system
  - dismantling linear actuators and tools, techniques, procedures and safety measures to be used
  - fitting bearings and seals
  - reassembly/fitting of cylinder/ram and sequence to be used
  - testing and verifying repairs using machine circuits and/or test rigs and necessary remedial action
- common faults in hydraulic components
- specifications and correct operation of each hydraulic system component and conductors
- removal methods for various components
- information in catalogues or electronic media and procedures to obtain replacement parts
- typical conductor types and fittings their applications
- methods for cutting/assembling hoses/tubes/pipework

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- tools and techniques for fitting replacement components and conductors
- methods of inspection and measurement and guides and specifications for reusable parts
- manufacturer scheduled service timeframes, service items and service procedures.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, fault finding and rectifying hydraulic systems for mobile plant at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27018 Test, diagnose and rectify mobile and stationary plant external monitoring and control systems

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to test, diagnose and rectify the systems used on stationary and mobile plant for functions that require communication to and from an external source. It covers installation, service and maintenance, diagnostics and troubleshooting of the on-board components of the communication, reporting and control systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits
MEM27016	Diagnose and maintain electronic controlling systems on mobile and

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	stationary plant
MEM27023	Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Locate and identify features and purpose of external communication systems**	2.1	Determine on-board methods of communication and data exchange with external source
		2.2	Locate on-board electronic control module (ECMs) associated with external monitoring and control systems
		2.3	Identify other external monitoring and control system hardware and components
3	**Test external monitoring and control system**	3.1	Ensure equipment is parked with engine off or in specified safe mode for testing
		3.2	Check for damage to externally located antennae, sensors and other system components
		3.3	Review previous records

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		3.4 Identify location of service ports and other test locations and connect laptop or test equipment
		3.5 Run specified test procedure or program to access data on system and plant performance
		3.6 Identify faults and determine if related to on-board component or ECM fault
		3.7 Analyse information from tests and test equipment and identify faults
		3.8 Trace on-board faults to root cause
		3.9 Report off-board faults in system according to SOP’s
4	**Rectify on-board faults**	4.1 Repair or rectify faulty system components
		4.2 Adjust program settings to workplace and manufacturer specifications for program related faults
		4.3 Report continued program faults according to workplace procedures
		4.4 Adjust, recalibrate or replace faulty sensors, aerials and antennae
5	**Re-test system and document work**	5.1 Re-test equipment external monitoring and control system to ensure compliance with specifications and workplace needs
		5.2 Undertake any required final adjustments
		5.3 Document work undertaken in accordance with procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

The systems and equipment covered by this unit are found in stationary and mobile plant used in one or more of the following:	• mining • agriculture • forestry • construction • transport industries
External monitoring and control systems include one (1) or more of the following:	• integrated original equipment manufacturer (OEM) management and monitoring systems • bolt on systems • remote control and guidance systems, including on and off site remote control systems • single equipment system telemetry and monitoring systems • multi-mode systems allowing choice of operator control, semi-autonomous and fully autonomous control • load and yield management and monitoring • equipment condition monitoring and reporting systems • safety related systems, including proximity awareness and collision avoidance systems
Communication and data exchange method includes one or more of the following:	• satellite • Wi-Fi • cellular • radio • global positioning system (GPS) • laser

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hardware and components include one (1) or more of the following

- on-board electronic control modules (ECMs)
- connectors
- memory and communication interfaces
- ethernet connectors
- broadband transmitter/receiver (could be built into other hardware e.g. a PC)
- radio frequency (RF) transmitter/receiver
- laser transmitter/receiver
- GPS receiver
- satellite dish/aerial
- displays, buzzers and signal lamps
- operator switches and controls
- antennae
- fieldbus cables and connectors to other on-board systems and ECMs
- sensors
- radar
- cameras
- service ports
- power input
- service ports to allow for laptops and other test instrumentation to be connected (e.g. USB, serial and connecting cables)

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

External communication systems can be related to single equipment system which include one (1) or more of the following:	• engine • tyres • load monitoring and reporting

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27018 Test, diagnose and rectify mobile and stationary plant external monitoring and control systems

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting information on external monitoring and control systems from multiple sources, including manufacturers' specifications, drawings, information provided by equipment operators, log books and job records and obtaining and accessing other relevant data manually or by electronic means on mobile plant and equipment performance
- identifying hazards associated with mobile plant and equipment and implementing appropriate risk control measures and procedures before undertaking testing procedures
- establishing correct connection of test equipment to on-board access points
- running of diagnostic programs and other tests to system manufacturer specifications
- interpreting test results for equipment condition and faults
- undertaking root cause analysis to identify cause of faults
- rectifying faults using appropriate rectification strategy, including repair, replacement, changing program settings or referral to engineering, technical or other personnel
- undertaking calculations and numerical operations associated with advanced equipment testing and diagnostics on mobile plant and equipment
- documenting all findings and outcomes in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- equipment system components and locations for:
  - acquisition of engine and other equipment systems real time operational data
  - data logging features, where fitted, for:
    - event list
    - system snapshot

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    - trend and cumulative data
  - data transmission and reception to on-board and external sensors and electronic control modules
  - system power
  - fieldbus data Links to other on board systems and electronic control modules (ECMs)
- system login procedures for operation and maintenance access levels
- on-board access points for test equipment
- correct fixing/mounting procedures for sensors, transmitters and receivers, antennae, aerials and satellite dishes
- procedures for running diagnostic programs and tests at equipment and component level
- sources of information available to assist in fault finding
- uses and parameters of information management systems
- required rectification for equipment faults
- practices and procedures in root cause analysis
- equipment performance specifications
- documentation requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in testing, diagnosing and rectifying mobile and stationary plant external monitoring and control systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27019 Diagnose, repair and replace diesel engines in stationary and mobile plant

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to diagnose, repair and replace diesel engines used in mobile and stationary plant and equipment.

It covers the diagnosis of diesel engine operation to determine location and cause of faults and whether in situ repair, more specialist investigation or engine removal for off-site repair is required. It includes bottom and top end repair of engines and re-installing repaired or replacement engines into stationary and mobile plant.

Where repairs to fuel, coolant, electrical and starting, exhaust systems, as well as transmissions and accessories and their components are required, see the appropriate units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **5**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055 Dismantle, replace and assemble engineering components

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Check engine performance**	2.1	Determine normal engine performance parameters from manufacturer specifications and workplace records
		2.2	Perform appropriate diagnostic tests for engine and equipment type
		2.3	Identify faults from diagnostic test results
		2.4	Determine appropriate action to rectify faults
3	**Remove engine and engine assemblies**	3.1	Remove engine and ancillary components according to manufacturer specifications, workplace procedures and WHS and environmental requirements
		3.2	Tag and record engine and ancillary components according to workplace procedures
		3.3	Prepare engine and engine assemblies for repair

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Repair engines**	4.1	Interpret characteristics of surface finishes and wear patterns on top and bottom end components
		4.2	Assess components for abnormal wear or defects
		4.3	Remove top-end components and dismantle block assembly according to manufacturer recommendations
		4.4	Select appropriate cleaning solution and procedure, clean and store components not requiring repair ready for reassembly
		4.5	Replace or repair faulty parts to manufacturer specification
		4.6	Test engine and make any required post-repair adjustments
5	**Install repaired or replacement engine**	5.1	Locate and fix engine according to manufacturer specifications
		5.2	Refit ancillary components and equipment systems
		5.3	Check and adjust lubricants, coolant, fuel and other required fluids
		5.4	Test engine and make any required post-installation adjustments
6	**Undertake completion tasks**	6.1	Clean work area and dispose of non-recyclable material according to workplace and environmental requirements
		6.2	Collect and store recyclable material in appropriate containers
		6.3	Check and store tools and equipment
		6.4	Document and report engine repair or replacement according to workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

The large diesel engines covered by this unit are used in one or more of the following:	• mobile plant • agriculture • forestry • rail • marine • other transport operations • power generation • air and gas compression • stand by power • other industry sectors using large combustion engines
Actions to rectify faults include one (1) or more of the following:	• on-site repair, including in an on-site workshop • installation of a new or reconditioned engine

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27019 Diagnose, repair and replace diesel engines in stationary and mobile plant

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to perform engine repair or replacement
- checking engine for conformance and removing the engine and top-end components and dismantling block assembly
- undertaking calculation and numerical operations to calculate bearing clearances
- checking parts for abnormal wear or defects and identifying components for reuse or replacement
- testing of cylinder head, spring tensions, valves and guides for conformance to specifications
- replacement of worn or faulty parts
- cleaning parts using appropriate solutions and safety precautions and rack and setting out engine parts according to their original position in readiness for reassembly
- obtaining and recording measurements and interpreting readings for replacement or reuse as being under or over size
- reassembling engine bottom-end components using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of surface finishes and wear patterns as applied to crankshaft and piston assemblies
- specifications of crankshaft and piston assemblies
- reasons for identifying the components for reuse or replacement
- procedures for:
  - dismantling the block assembly and removing the engine from the plant

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  - removing the top-end from the engine
  - cleaning engine parts and solution to be applied
  - racking and/or setting out of parts in readiness for reassembly
  - recording engine measurements
  - removing ridges, gaps, tapers, ovality and protrusions
  - assembling engine bottom-ends and precautions to be taken
  - determining bearing clearances and methods to be applied
- tools, techniques and equipment to be used and reasons for selection
- action to be taken when abnormal wear or defects are observed in the engine components
- measuring instruments to be used to measure engine components
- concept of under/over size of replacement parts and the reasons for identifying replacement parts as under or over size
- tools, techniques and equipment required to correct faults.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing, repairing, removing and replacing diesel engines in stationary and mobile plant at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27020 Apply knowledge of large combustion engine operations to service and maintenance tasks

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to identify engine features and operations essential for large engine servicing and maintenance tasks.

It includes identifying and assessing large combustion engines, the equipment powered by the engines, and the operations the equipment is required to perform and applying this information to engine service and maintenance tasks.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Prepare for service and maintenance task**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Identify engine type and any special features for relevance to service and maintenance task**	2.1	Locate sources of information on equipment, engine, systems and components
		2.2	Identify engine type and configuration
		2.3	Locate and identify ignition, starting, air, fuel, coolant, exhaust and lubrication system components
		2.4	Identify engine components and sensors
		2.5	Identify fuel, oil and coolant specifications for engine and check against service records
		2.6	Identify environmental controls and features
3	**Review equipment systems and accessories for relevance to service and maintenance task**	3.1	Identify equipment systems requiring engine power
		3.2	Identify other equipment systems and accessories
		3.3	Review operator records and service history for information relevant to engine service and maintenance
		3.4	Review manufacturer instructions for recommended engine operation
		3.5	Assess contamination risk to oil, fuel, coolant and lubrication systems
4	**Confirm or adjust service and**	4.1	Review original job specification against results of checks of engine and equipment specifications, service and operator

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
maintenance job requirement	records
	4.2 Confirm job specification or recommend adjustments

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

The large diesel engines covered by this unit are used in one or more of the following:	• mobile plant • agriculture • forestry • rail • marine • other transport operations • power generation • air and gas compression • stand by power • other industry sectors using large combustion engines
Engine powered equipment systems include one (1) or more of the following:	• hydraulic and pneumatic systems for accessories • mechanical and traction drives • alternators and generators • heating, ventilation, air conditioning and refrigeration HVAC/R equipment • air compressors

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Environmental controls and features include the following:	• components and systems designed to minimise noise pollution or visual impact of mobile and stationary equipment and engines
Engine consumables include one (1) or more of the following:	• filters • coolants • lubricants • hydraulic and other fluids • additives • simple drive belts • coolant hoses

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27020 Apply knowledge of large combustion engine operations to service and maintenance tasks

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following manufacturer and work instructions, standard operating procedures (SOPs) and safe work practices
- identifying appropriate sources of information on engine and equipment
- carrying out classification of large combustion engines from observation, manufacturer instructions and manuals and workplace records, including classification of:
  - engine type
  - engine features
  - engine systems
  - engine components
  - fuel type and fuel system
- assessing implications of engine and equipment service history and equipment operational records for service and maintenance tasks
- recording and reporting service activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- classification of combustion engines, including:
  - internal and external combustion
  - reciprocating and rotary engines
  - two and four stroke cycles
  - spark ignition and compression ignition
  - turbines
- engine features, including:
  - number and arrangement of cylinders
  - materials used for major components (e.g. steel, aluminium and ceramic)

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- fuel types and implications for engine operation and maintenance (e.g. petrol, diesel, diesel/gas, gas (natural gas, biogases and special gases))
  - engine location:
    - front, mid or rear engine
    - longitudinal or transverse engine
  - ignition system, components and firing order
  - operational parameters, including:
    - bore and stroke
    - displacement
    - compression ratio
    - efficiency
  - torque, horsepower and brake horsepower
  - cycles of engine operation:
    - intake stroke
    - compression stroke
    - power stroke
    - exhaust stroke
- principles of operation of engine oil, fuel, lubrication and cooling systems, including:
  - function of filters
  - purpose of additives and correct proportions to be used
  - symptoms and effects of contamination, abnormal engine operation and extremes of weather
- role and operation of major engine components, including:
  - timing belt or chain
  - camshaft timing pulley
  - camshaft single and dual
  - rocker arms and shafts
  - intake valves and springs
  - exhaust valves and springs
  - cylinder head
  - crankshaft and crankshaft pulleys, balancer and balance weights and bearing journals
  - flywheels
  - starter ring gear
  - engine block
  - pistons
  - connecting rods
- exhaust system and components.

Assessment Conditions

- Assessors must:

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  - have vocational competency in applying knowledge of large combustion engine operations to service and maintenance tasks at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27021 Maintain, fault find and repair stationary plant gas turbine engines

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to maintain gas turbine engines used in stationary plant applications.

It covers scheduled servicing, preventative maintenance, fault finding and repair or rectification of faulty operation and components undertaken on gas turbine engines up to 5 GJ/hr (1300 kw) capacity, including ancillary equipment that may be associated with the engine operation.

The application of the skills and knowledge described in this unit in some states/territories may require an authority to practice in the workplace. Other conditions may apply under state and territory legislative and regulatory requirements.

Band: **A**

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets and work instructions
2	**Inspect gas turbine engine system and components**	2.1	Determine normal gas turbine engine performance parameters from manufacturer specifications and workplace records
		2.2	Prepare engine for engine safe system inspection and operation in accordance with manufacturer specification
		2.3	Check gas turbine engine components visually for external and internal signs of defects
		2.4	Check pipes, cables and connections for wear and damage
		2.5	Perform appropriate diagnostic tests for engine and equipment type
		2.6	Identify faults from diagnostic test results
		2.7	Determine appropriate action to rectify faults
3	**Test gas turbine engine system**	3.1	Identify test ports and connectors and connect test equipment
		3.2	Follow specified test procedure or run diagnostic program to access data on engine performance
		3.3	Test safety systems and emergency shut offs

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		3.4	Identify faults and determine if related to engine, associated systems or control fault
		3.5	Trace fault to root cause
		3.6	Obtain specialist advice, where required, to assist with the troubleshooting process
4	**Service gas turbine engine**	4.1	Check and replace air and oil filters if required or to manufacturer schedule
		4.2	Test and adjust regulator, operation and safety controls
		4.3	Pressure test gas, oil, and air pipes and hoses and purge, as required
		4.4	Lubricate engine and components according to maintenance schedule
		4.5	Document engine service to workplace requirements
5	**Rectify faults according to manufacturer specifications**	5.1	Assess components for abnormal wear or defects
		5.2	Replace faulty or worn components
		5.3	Remove corrosion where required
		5.4	Finish or re-finish metal surfaces through polishing, lapping and blending of damage area or other specified process
		5.5	Apply required surface treatments
		5.6	Test engine and make any required post-repair adjustments
6	**Install new, repaired or replacement engine**	6.1	Locate and fix engine according to manufacturer specifications
		6.2	Refit ancillary components and equipment systems
		6.3	Check and adjust lubricants, coolant, fuel and other required fluids

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	6.4 Test run engine and make any required post-installation adjustments
7 **Complete repair or installation**	7.1 Clean work area and dispose of non-recyclable material according to workplace and environmental requirements
	7.2 Collect and store recyclable material in appropriate containers
	7.3 Check and store tools and equipment
	7.4 Document and report engine repair or replacement according to workplace procedure

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Ancillary equipment includes one (1) or more of the following:	• pumps • compressors • fluid power equipment • metering equipment • electrical controls • electronic controls

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Gas turbine engine and components include one (1) or more of the following:

- engine change unit, main components and accessories/drives
- control components, including valves, meters and regulators
- ignition and starter system components
- fuel system components, including:
  - manifold and nozzles
  - combustion chambers
  - filters
- oil system components
- air system components, including:
  - air inlet structures
  - fans
  - guide vanes
  - centrifugal or axial flow compressor assemblies (low and high pressure)
  - compressor bleed valves if fitted
- exhaust system components, including:
  - high and low pressure turbine assemblies
  - free turbine (where fitted)
  - exhaust outlet flues and shafts

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Actions to rectify faults include one (1) or more of the following:	• on-site repair, including in an on-site workshop • removal of engine to a specialist engine repair facility • installation of a new or reconditioned engine

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27021 Maintain, fault find and repair stationary plant gas turbine engines

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to perform engine repair or replacement
- testing of turbine engine operation with and without fuel
- checking gas turbine engine performance against specifications for conformance
- purging of gas turbine and associated equipment
- checking components and parts for abnormal wear or defects and identifying whether to reuse, repair or replace components and parts
- replacing worn or faulty parts
- cleaning parts using appropriate solutions and safety precautions and rack and setting out engine parts according to their original position in readiness for reassembly
- obtaining and recording measurements and interpreting readings for replacement or reuse as being under or over size
- assembly and disassembly of gas turbine engine using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools, techniques and equipment to be used and reasons for selection
- characteristics of surface finishes and wear patterns as applied to gas turbine engine components
- criteria for identifying the components for reuse or replacement
- gas turbine engine layout and operation, including:
  - types of gas turbine
  - operating principles and power output
  - gas path

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  - intakes
  - compressors
  - combustion chambers
  - turbine blades
  - air intake path
  - exhaust path
  - bearings and seals
  - lubrication system
  - starting system
  - ignition system
  - safety systems, including safety shut off systems, leak detection systems and vents
- controls and instrumentation, including systems and controls for remote operation and monitoring
- action to be taken when abnormal wear or defects are observed in the engine components
- test instruments and tools used for gas turbine service and maintenance
- purging procedure for the stationary gas turbine and associated equipment
- gas turbine engine fuel types, properties and applications
- relevant standards and regulations including AS 3814:2015 Industrial and commercial gas-fired appliances and AS/NZS 5601 Gas installation
- concept of under/over size of replacement parts and the reasons for identifying replacement parts as under or over size
- tools, techniques and equipment required to correct faults.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, fault finding and repairing stationary plant gas turbine engines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27022 Maintain, fault find and repair traction drive mechanics

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to maintain and repair traction drive systems on transport and mobile equipment.

It covers the skills and knowledge for mechanical related maintenance and fault finding of traction drive systems, including fault finding and rectifying mechanical systems and components supporting the operation of the traction drive system.

Where the connection and disconnection of electrical equipment operating above 36 volts is required, see unit MEM18045 Fault find and repair electrical equipment/components up to 250 volts single phase supply or unit MEM18046 Fault find and repair electrical equipment/components up to 1000 volts a.c./1500 volts d.c.

The application of the skills and knowledge described in this unit in some states/territories may require an authority to practice in the workplace. Other conditions may apply under state and territory legislative and regulatory requirements.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits
MEM27016	Diagnose and maintain electronic controlling systems on mobile and stationary plant

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets and work instructions
		1.5 Check equipment operational records and fault reports and codes for indications of traction system problems
2	**Diagnose and rectify traction drive mechanical components**	2.1 Observe engine and alternator or generator during operation for signs of abnormal shaft vibration and noise
		2.2 Inspect shafts and bearings from prime mover to alternator or generator for poor lubrication, wear, overheating, corrosion or other faults
		2.3 Rectify shafts and bearings through repair or replacement
		2.4 Align shaft to manufacturer specifications using specified procedures and test instruments

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		2.5	Assess coupler and bearing clearances and adjust, as required
		2.6	Check dynamic retarding components, including resistance grids, cooling air ducts and fan/blowers for operation and blockages and repair/rectify damaged components
		2.7	Check wheel motor assemblies for alignment, wear, vibration and rectify faults to manufacturer specifications
		2.8	Test operation of solenoids, valves, sensors, links to electronic control modules (ECMs) and rectify where required
		2.9	Arrange for repair/rectification of any identified electrical related faults
3	**Remove or install new, repaired or replacement major traction drive components**	3.1	Ensure equipment is parked safely, engine off and battery, other electrical and hydraulic systems de-energised
		3.2	Check all cables, hoses and pipes are disconnected
		3.3	Remove or install major component according to manufacturer specifications
		3.4	Remove or refit ancillary components, hoses, pipes, sensors, fieldbus links and connections
		3.5	Arrange for connection of low and/or high voltage power supply connections
4	**Complete repair or installation**	4.1	Test run equipment and make any required post-installation adjustments
		4.2	Document work undertaken on traction drive according to workplace procedure

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Major traction drive components include the following:	• alternator • generator • drive shaft from engine • cooling grid/s • inverters • rectifiers • wheel motors • blowers/fans
Actions to rectify faults include one (1) or more of the following:	• on-site repair, including in an on-site workshop • removal of component to a specialist off-site repair facility • referral of the fault to other trade, technical or professional personnel for rectification

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27022 Maintain, fault find and repair traction drive mechanics

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to perform engine repair or replacement
- testing procedures for traction drive components
- checking traction drive and equipment performance against specifications
- checking components and parts for abnormal wear or defects and identifying whether to reuse, repair or replace components and parts
- aligning shafts from engine to alternator or generator
- replacement of worn or faulty parts
- obtaining and recording measurements and interpreting readings for replacement or reuse as being under or over size
- assembly and disassembly of traction drive components using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tools, techniques and equipment to be used and reasons for selection
- criteria for identifying components for reuse or replacement
- traction system layout and principles, including:
  - types of engines (prime movers) and operating principles and power output
  - relationship of alternator/generator speed/load to engine performance
  - power path to motors, including role of engine, alternators/generators, inverters and rectifiers, and dynamic retarding, including function of cooling grid and blower, and wheel motors
- controls and instrumentation, including systems and controls for remote operation and monitoring

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- action to be taken when abnormal wear or defects are observed in the traction drive components
- test instruments and tools used for traction drive service and maintenance.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, fault finding and repairing traction drive mechanics at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27023 Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment

Modification History

Release 1: New Unit

Application

This unit of competency defines the skills and knowledge required to carry out diagnosis and rectification of circuits used in controller area network (CAN) and other fieldbus systems and control technology components in mobile and stationary plant.

It applies to systems and components that do not require a host computer. The unit can apply to circuits used for communication with and between systems and components, including systems for engine management, suspension, hydraulics and pneumatics, chassis and body management, braking systems, mechanical, electrical and hydraulic drives, lighting control, air conditioning, vehicle guidance and telemetry.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits

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Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify bus and control system components and location**	2.1	Examine appropriate drawings, specifications and manuals for bus and control system information
		2.2	Perform a visual inspection of equipment and identify location and any obvious faults in bus and control system wiring and components
3	**Check bus and control system wiring and rectify faults**	3.1	Ensure battery is charged and charging system is operating correctly
		3.2	Test voltage supply, input voltage and ground
4	**Assess and rectify wiring faults**	4.1	Isolate wiring and sensor faults
		4.2	Determine replacement sensors and cables/wires, including size and insulation quality
		4.3	Make up wiring looms for application and securely fix
		4.4	Strip, fit, prepare and terminate wiring and cables
		4.5	Test terminated cables for continuity and to comply with requirements
		4.6	Remove corrosion, neutralise and apply appropriate protective coating
		4.7	Test sensors, relays, solenoids, contacts and circuits and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	repair/replace

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Circuits include one (1) or more of the following:	• bus communication • module (node) power • input power • grounding
Control module applications include one (1) or more of the following:	• engine control • hydraulic systems • pneumatic systems • traction control • mechanical drives • chassis and body control • braking • air-conditioning • load control • exhaust and environmental systems • tyre and track monitoring • remote guidance and control • doors and other access locks • interior and exterior lighting • seat adjustment • power windows • turning and other indicators

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- low voltage electric motors
- hazard and brake lights
- sensors

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27023 Diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment

Modification History

Release 1: New Unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, standards, charts, lists, SOPs, electrical drawings and diagrams to diagnose and rectify fieldbus circuits in mobile and stationary plant and equipment
- selecting and using the correct test instrument, including multimeters, amp meters and circuit testers for bus and control system circuits and components
- assessing condition and serviceability of components, including connectors, resistors, harnesses, boards, sensors, switches, fuses and seals
- applying Ohm's Law to determine the required values of current, voltage and resistance of a range of electrical circuits, including series, parallel and series parallel
- connecting electrical test instruments into given circuits to determine the required values of current, voltage and resistance in a safe and effective manner
- connecting and adjusting multi-channel and general purpose oscilloscopes to a given electrical circuit to measure wave forms at nominated points in the circuit
- fault finding using fault-finding techniques to identify wiring faults in electrical circuits
- selecting appropriate replacement cables according to size, rating and insulation resistance from supplier catalogues
- making up replacement wiring looms, strip and prepare cable ends for termination and terminate to specifications
- testing terminations for continuity and to comply with requirements
- removing and/or neutralising corrosion from terminals and connections and applying appropriate protective coating.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of electron theory
- definitions of current, voltage and resistance in terms of electrical circuits

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- Ohm's Law and the relationships between current, voltage and resistance for a variety of given electrical circuits
- instruments and procedures to be used to measure current, voltage and resistance and safety precautions to be taken
- procedures for maintaining electrical test equipment
- principles and functions of two wire differential serial bus systems, including:
  - communication and power cables for bus systems
  - voltage states relative to shield or ground and role in information transfer
  - logic states
  - channels
  - communication protocols, including message priority and identification
  - electronic control modules (ECMs)
  - engine control modules
  - power distribution boards
  - ground modules
  - typical diagnostic codes and faults
  - cabin displays
- symbols used in electrical drawings/diagrams
- components of a variety of electrical circuits identified by given electrical drawings/diagrams
- differences between series and parallel electrical circuits
- function of a general purpose and multi-channel oscilloscopes and procedures for connecting oscilloscopes to bus and control system circuits and components
- use of wave forms in the testing of circuits
- accuracy to which electrical test equipment can be read
- examples and causes of common faults in electrical wiring and test procedures for isolating wiring faults
- specifications of cables and wires including insulation resistance used in given electrical circuits
- test procedures for terminated wiring and cables
- effect of corrosion on the performance of electrical circuits and connections
- common faults and causes in sensors, relays, solenoids, contacts and circuits and procedures for testing circuit components.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying fieldbus circuits in mobile and stationary plant and equipment at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27024 Diagnose and rectify mobile plant hydrostatic systems

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to assess converter/transmission operation, and repair or replace faulty components.

It applies to hydrostatic systems used in mobile plant applications, including steering, transmissions and other closed circuit systems. It provides additional specialist skills and knowledge in hydrostatics and is designed to complement the MEM units relevant to the particular equipment systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27017	Maintain, fault find and rectify hydraulic systems for mobile plant

Competency Field

Fixed and Mobile Plant

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify and assess the function and operation of hydrostatic system components**	2.1	Identify motor and pump configurations used on equipment
		2.2	Identify pump types and control methods
		2.3	Check pump prime mover and alignment
		2.4	Identify charge pumps and assess operation against specifications
		2.5	Identify control valves and functions, including special control features
		2.6	Identify load sensors, other sensors, control modules, fieldbus circuits and other electrical or electronic components
		2.7	Locate and check filters, hydraulic lines, heat exchangers and reservoirs
		2.8	Test system operation and integrity according to manufacturer specifications
3	**Repair/replace faulty components**	3.1	Interpret test results and determine components requiring repairs or replacement
		3.2	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.3	Select replacement components using manufacturer’s data
		3.4	Remove and refit components to hydrostatic system using appropriate tools, equipment and techniques
		3.5	Test performance of hydrostatic system against specification

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.6 Record all test and rectification activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hydrostatic motor and pump configuration includes one (1) or more of the following:	• close coupled (motor and pump back to back units) • split units (separate motor and pump) single and double • multiple pump/motor layouts • series and parallel operation • fixed and variable displacement pumps
Control valves include one (1) or more of the following:	• hot oil shuttle valves • cross-line relief valves • counterbalance valves • bypass valves • differential lock valves • parking brake valves
Hydrostatic special control features include one (1) or more of the following:	• inch control • creep speed • brake defeat function • hydrostatic braking

Unit Mapping Information

No equivalent unit.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27024 Diagnose and rectify mobile plant hydrostatic systems

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions using different types of mobile plant hydrostatic systems and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings, design rules and other applicable reference documents to mobile plant hydrostatic systems
- performing diagnostic testing procedures for hydrostatic transmissions, including:
  - flow and pressure testing
  - measuring case drains
  - internal and external fluid leaks
  - abnormal noises and operation
  - scan tools and/or multimeter testing
- undertaking calculation and numerical operations associated with diagnosing and rectifying closed circuit fluid power systems
- checking hydrostatic system components for wear and clearance
- removing, refitting, adjusting and aligning hydrostatic system components
- selecting and using appropriate test equipment to test components for compliance to specifications
- interpreting fault codes and data from test equipment and control modules
- identifying faulty components visually and by using and adapting appropriate testing equipment and identifying components for reuse or replacement
- removing and refitting components to hydrostatic assembly and selecting replacement parts using manufacturer catalogues and data
- adjusting components using appropriate tools, techniques and equipment
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)

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- different pump and motor configurations and their advantages and disadvantages in mobile applications, including:
  - close coupled (motor and pump back to back units)
  - split units (separate motor and pump) single and double
  - multiple pump/motor layouts
- method of operation and assembly/disassembly procedures for axial, bent axis and radial pumps
- pump control methods, including:
  - mechanical
  - mechanical servo
  - pilot pressure
  - electronic servo
  - pressure/limitation and displacement control
- operating principles of charge pumps, including construction, circuitry, case flushing and cooling and heating functions
- functions and types of control valves used in hydrostatic/closed circuit systems
- flow amplifiers and functions
- effect of engine speed and performance on hydrostatic system
- methods for checking hydrostatic system components for wear and clearance
- procedures used to remove, refit, adjust and align hydrostatic system components
- recording requirements for test and rectification activities
- appropriate action to correct the faulty components
- test equipment to be used in checking/testing mobile plant hydrostatic systems for correct operation and reasons for selection
- tools, techniques and equipment used in maintaining and repair hydrostatic system assemblies.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying mobile plant hydrostatic systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills

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- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27025 Maintain, diagnose and rectify fluid power controls in mobile equipment

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to install and repair and/or rectify fluid power controls used in mobile equipment applications.

It applies to hydraulic fluid power systems control circuits and may also apply to mobile equipment using pneumatic systems. Where pneumatic controls are also to be maintained, relevant pneumatic units should also be selected.

It covers fault finding of fluid power systems control circuits, maintaining and repairing or replacing system control components, and checking and adjusting the operation of fluid power system controls. System circuit/components are identified, traced, inspected and operational function is assessed and verified using fluid power principles to predetermined specifications interpreted from data sheets and circuit diagrams.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit Weight: **6**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits

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MEM27017 Prepare composite or other substrate surfaces

Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Identify/inspect or install fluid power systems and controls**	2.1	Interpret and apply fluid power control principles and system/circuit diagrams
		2.2	Identify control modules, fieldbus wiring, sensors and control module locations for fluid power systems
		2.3	Conduct initial inspection of fluid power system/circuit components for compliance with specifications
		2.4	Undertake sequential installation according to manufacturer specifications and SOPs
3	**Check and adjust fluid power system control sequence and operation**	3.1	Check controls and system operation against operational specifications using appropriate test equipment and application principles/techniques
		3.2	Perform adjustments to sequence system to meet/align to operational requirements and specifications
		3.3	Report modifications/alterations and according to SOPs
		3.4	Check controls and system operation and commission to specifications

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Fault find fluid power systems control circuit**	4.1	Interpret and apply system/circuit diagrams and data sheets
		4.2	Identify and inspect system/circuit components
		4.3	Trace system/circuit and diagnose action of components to identify and localise faults
		4.4	Test system/circuit parts using appropriate test equipment and application principles
		4.5	Assess system/circuit parts against operational specifications
		4.6	Localise fault condition at the component level
		4.7	Evaluate faulty condition, analyse root cause and plan corrective action
5	**Maintain and repair or rectify system control components**	5.1	Apply correct maintenance procedures
		5.2	Select and apply repair procedures using appropriate tools, equipment and techniques
		5.3	Test faulty items, repair or replace using sequential installation procedures according to manufacturer recommendations
		5.4	Select replacement items from appropriate sources
		5.5	Reassemble system control components according to specifications
6	**Check and adjust sequence of fluid power system controls**	6.1	Identify circuit sensors and controllers using circuit diagrams and fluid power system control principles
		6.2	Make necessary adjustments to sequence system control circuit to meet operational specification
		6.3	Check and verify correct operation of system control circuit against operational specification
		6.4	Commission fluid power system controls to specifications
		6.5	Adopt appropriate follow-up procedures
		6.6	Complete service/maintenance report

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fluid power system controls include one (1) or more of the following:	• fieldbus system control unit • integrated or separate measurement/testing/data logging equipment • electronic proportioning and bus systems • proportional and servo controlled valving and the associated electronic amplifiers and drivers • joystick • controller variable and/or digital inputs and outputs • sensors • digital/analog transducers and proximity switches • transducers • timers • counters • ancillary equipment

Unit Mapping Information

No equivalent unit.

Links

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Assessment Requirements for MEM27025 Maintain, diagnose and rectify fluid power controls in mobile equipment

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- obtaining and interpreting specifications system/circuit diagrams, system operation and control data records and identifying and inspecting system components for compliance with specifications
- planning and undertaking sequential installation of fluid power systems and controls in accordance with manufacturer specifications and procedures
- checking and adjusting control and system operation using appropriate test equipment ensuring that the sequence of operations conforms to specifications and operational requirements
- recording/reporting any modifications/alterations to the system in accordance with SOPs
- fault finding fluid power systems control circuits and controllers using fault-finding techniques and appropriate test equipment and identifying and localising components not conforming to operational specifications for repair/replacement
- repairing/replacing faulty items after testing for compliance to specifications using appropriate tools, equipment and techniques
- reassembling control components to meet specifications
- verifying correct operation of system power control circuit and commission the fluid power system controls to specifications
- initiating maintenance and/or service follow-up procedures and completing maintenance and/or service reports according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- system operational and control requirements and specifications
- application of common fluid power system components and controllers
- basic electronic concepts, including current/voltage/power and solenoid coils
- pulse width modulation (PWM) and its function/application

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- function of analogue controllers in simple fluid power systems
- digital controllers in mobile fieldbus systems (e.g. controller area network (CAN) bus) and their function and capabilities
- controller fault code interrogation and interpretation, where available
- circuit sensors and controllers
- temperature transducers
- data loggers – types and basic function
- special installation requirements
- fluid power and common test equipment and their application
- correct operational sequence of the system
- typical adjustments to correct sequencing variations from specification
- procedures for recording/reporting modifications/alterations and consequences of not recording/reporting
- fluid power system commissioning procedures
- components not complying with operational specification and typical causes of component failure
- cause of the faulty condition in the components and appropriate procedures for rectifying the faulty condition
- appropriate maintenance schedule and procedures
- appropriate control component repair procedures
- typical test equipment and its application
- common adjustments that can be made to control systems and their effect
- any maintenance/service follow-up procedures
- maintenance/service recording/reporting requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in maintaining, diagnosing and rectifying fluid power controls in mobile equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications

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- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27026 Service and repair mobile plant air conditioning systems

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required to service and repair in cabin air conditioning systems installed in mobile plant and rail vehicles.

It covers systems supplying heating, ventilation, air conditioning (HVAC) and cooling systems to operator compartments and includes servicing, fault finding, repairing and replacing of control and operating components, refrigerant check, replacement and recovery, and recommissioning of the air conditioning system.

This unit forms part of the requirements to obtain an Australian Refrigeration Council (ARC) Refrigerant handling licence – qualified persons (Automotive air conditioning licence.)

In some jurisdictions, an occupational licence for refrigeration/air conditioning or electrical restricted licence may be required.

Band: A

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5	Plan job to conform to Australian Refrigeration Council (ARC) code of practice requirements
2	**Service mobile plant air conditioning system**	2.1	Check that mobile plant is parked and engine/power source are safe for air conditioning system access and work
		2.2	Conduct visual check of mobile plant air conditioning system
		2.3	Identify control modules, fieldbus wiring, sensors and control module locations for air conditioning system
		2.4	Test air conditioning system according to manufacturer specifications
		2.5	Service system and components to manufacturer specifications and workplace requirements
		2.6	Identify performance faults, leaks and blockages
		2.7	Comply with regulations regarding any required topping up of refrigerant
		2.8	Document test results according to workplace procedures
3	**Fault find mobile plant air conditioning system**	3.1	Interpret system/circuit diagrams and data sheets
		3.2	Identify and inspect system and circuit components
		3.3	Select diagnostic procedures and test equipment appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
		to the system and operational history of the vehicle
		3.4 Check for leaks and blockages
		3.5 Conduct diagnostic tests on system and components performance
		3.6 Inspect and assess system/circuit parts against operational specifications
		3.7 Evaluate faulty conditions, analyse root cause and plan corrective action
		3.8 Repair or replace faulty components
		3.9 Recharge refrigerant according to procedures and regulations
4	**Recommission mobile plant air conditioning system**	4.1 Reassemble air conditioning system
		4.2 Conduct post-repair/post-servicing system checks for correct operation
		4.3 Document service and repair actions according to workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mobile plant air conditioning systems include one (1) or more of	• in cabin units • above, behind or below cabin units • single units that feed two driver cabins (e.g. some locomotive

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

the following:	systems)
Mobile plant air conditioning system components include one (1) or more of the following:	• fieldbus system control unit, modules and sensors relevant to the air conditioning system • integrated or separate measurement/testing/data logging equipment • pumps • motors • compressors • condensers • filters • pipes and hoses • switches • valves • coils and radiators • receivers • ancillary equipment

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27026 Service and repair mobile plant air conditioning systems

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices including refrigerant safe handling procedures
- obtaining and interpreting specifications air conditioning system/circuit diagrams, system operation and control data records, and identifying and inspecting system components for compliance with specifications
- planning and undertaking sequential servicing of air conditioning system in accordance with manufacturer specifications and regulatory requirements
- checking and adjusting control and system operation using appropriate test equipment, including checking for:
  - ambient and vent temperature
  - condenser and suction temperature
  - manifold gauge pressure
  - refrigerant leaks
  - heater core and system water coolant leaks
- ensuring that the sequence of operations conforms to specifications and operational requirements
- recording/reporting any modifications/alterations to the system in accordance with SOPs
- fault finding air conditioning systems controls and circuits using fault-finding techniques and appropriate test equipment
- repairing/replacing faulty items after testing for compliance to specifications using appropriate tools, equipment and techniques
- reassembling of air conditioning system to meet specifications
- verifying correct operation of air conditioning system after service and repair
- initiating maintenance and/or service follow-up procedures and completing maintenance and/or service reports according to SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- types of air conditioning systems used in mobile applications, including:
  - piston, scroll and rotary vane compressors
  - electric compressors
  - variable displacement compressors
  - clutchless compressors
  - single and multi-zone
- system operational and control requirements and specifications, including:
  - high and low pressure switches
  - pressure relief valves
  - temperature sensors
  - sunlight sensors
  - zone temperature sensors
  - carbon dioxide sensors
- heating system components, including core, control valve, blower motor and fan, ducts, controls and sensors
- typical mobile systems refrigerants, their features and applications and relationship to Australian Refrigerant Council (ARC) regulatory requirements
- lubricating oils
- application of air conditioning system components and controls
- digital controllers in mobile fieldbus systems (e.g. controller area network (CAN) bus) and their function and capabilities in regards to air conditioning systems
- controller fault code interrogation and interpretation where installed
- circuit sensors and controllers
- special system installation requirements
- air conditioning system test equipment and test procedures, including use of:
  - manifold gauges
  - surface probe thermocouples
  - temperature gauges
  - scan tools
  - electrical test equipment
  - electronic leak detectors
  - recovery units
  - vacuum pumps
  - electronic scales
  - other test equipment relevant to the vehicle system
- correct operational sequence of the system
- typical adjustments to correct sequencing variations from specification
- procedures for recording/reporting modifications/alterations and consequences of not recording/reporting
- air conditioning system commissioning procedures

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- components not complying with operational specification and typical causes of component failure
- cause of the faulty condition in the component and appropriate procedures for rectifying the faulty condition
- appropriate maintenance schedule and procedures
- appropriate control component repair procedures
- typical test equipment and its application
- common adjustments that can be made to control systems and their effect
- any maintenance/service follow-up procedures
- maintenance/service recording/reporting requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in the service and repair of mobile plant air conditioning systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27027 Install or modify mobile plant air conditioning systems

Modification History

Release 1: New unit

Application

This unit of competency defines the skills and knowledge required for installing or modifying in cabin air conditioning systems installed in mobile plant and rail vehicles.

The unit covers systems supplying heating, ventilation, air conditioning (HVAC) and cooling systems to operator compartments and includes installing new air conditioning systems into new or operating mobile plant or rail vehicles, modification of existing air conditioning systems, commissioning of systems and replacement and recovery of refrigerant.

This unit forms part of the requirements to obtain an Australian Refrigerant Council (ARC) Refrigerant handling licence – qualified persons (Automotive Air Conditioning Licence).

In some jurisdictions, an occupational licence for refrigeration/air conditioning or electrical restricted licence may be required.

Band: B

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Fixed and Mobile Plant

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1	**Determine job requirements**	1.1 Follow standard operating procedures (SOPs)
		1.2 Comply with work health and safety (WHS) requirements at all times
		1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4 Identify job requirements from specifications, drawings, job sheets or work instructions
		1.5 Plan job to conform to Australian Refrigeration Council (ARC) code of practice requirements
2	**Install air conditioning system in new mobile plant**	2.1 Check that mobile plant is parked and engine/power source are safe for air conditioning system access and work
		2.2 Check cabin installation site against drawings or specifications for access, dimension and levels
		2.3 Check supplied air conditioning system matches specification and is complete
		2.4 Identify locations for structural support brackets and other support and holding components
		2.5 Identify air conditioning connection location and requirements for power, control modules, fieldbus wiring and sensors
		2.6 Prepare all surfaces, materials and components for use
		2.7 Install air conditioning system and connections in conformance with manufacturer and customer specifications
		2.8 Check air conditioning system is levelled, aligned, coupled and connected in accordance with specifications
		2.9 Charge system with specified refrigerant according to manufacturer specifications and regulatory requirements

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
3	**Modify or retrofit mobile plant air conditioning system**	3.1 Determine modification requirements from customer specifications, job instructions and drawings, and equipment manuals
		3.2 Check that mobile plant is isolated/made safe according to SOPs
		3.3 De-gas system using approved recovery unit and appropriate refrigerant recovery cylinder for the refrigerant type
		3.4 Recover oil and evacuate system
		3.5 Remove air conditioning system or components requiring modification according to SOPs
		3.6 Retrofit or modify air conditioning system according to manufacturer specifications and customer requirements
		3.7 Pressure test system and identify leaks and non-conformances to specifications
		3.8 Re-charge system with specified refrigerant according to manufacturer specifications and regulatory requirements
4	**Test and complete installation of new /retrofitted or modified mobile plant air conditioning system**	4.1 Test air conditioning system for correct operation against specifications
		4.2 Trace non-conformances to specifications to root cause and rectify
		4.3 Document installation or modification actions according to workplace procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mobile plant air conditioning systems include one (1) or more of the following:	• in cabin units • above, behind or below cabin units • single units that feed two driver cabins e.g. some locomotive systems
Mobile plant air conditioning system components include one (1) or more of the following:	• fieldbus system control unit, modules and sensors relevant to the air conditioning system • integrated or separate measurement/testing/data logging equipment • pumps • motors • compressors • condensers • filters • pipes and hoses • switches • valves • coils and radiators • receivers • ancillary equipment

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27027 Install or modify mobile plant air conditioning systems

Modification History

Release 1: New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices, including refrigerant safe handling procedures
- obtaining and interpreting specifications, air conditioning system/circuit diagrams, system operation and control data records and identifying and inspecting system components for compliance with specifications
- checking of new air conditioning systems and components for quality and completeness
- planning installation, retrofitting or modification to ensure efficient assembly/disassembly of air conditioning systems and compliance with manufacturer specifications and regulatory requirements
- checking and adjusting control and system operation using appropriate test equipment, including checking for:
  - ambient and vent temperature
  - condenser and suction temperature
  - manifold gauge pressure
  - refrigerant leaks
  - heater core and system water coolant leaks
- ensuring that the sequence of operations conforms to specifications and operational requirements
- recording/reporting any required modifications/alterations to new/retrofitted units in accordance with SOPs
- testing air conditioning systems controls and circuits using appropriate test equipment
- repairing/replacing faulty items after testing for compliance to specifications using appropriate tools, equipment and techniques
- reassembling of air conditioning system to meet specifications
- verifying correct operation of air conditioning system after service and repair.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

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- safe work practices and procedures and use of personal protective equipment (PPE)
- types of air conditioning systems used in mobile applications, including:
  - piston, scroll and rotary vane compressors
  - electric compressors
  - variable displacement compressors
  - clutchless compressors
  - single and multi-zone
- system operational and control requirements and specifications, including:
  - high and low pressure switches
  - pressure relief valves
  - temperature sensors
  - sunlight sensors
  - zone temperature sensors
  - carbon dioxide sensors
- heating system components, including core, control valve, blower motor and fan, ducts, controls and sensors
- typical mobile systems refrigerants, their features and applications and relationship to Australian Refrigerant Council (ARC) regulatory requirements
- lubricating oils
- application of air conditioning system components and controls
- digital controllers in mobile fieldbus systems (e.g. controller area network (CAN) bus) and their function and capabilities in regards to air conditioning systems
- controller fault code interrogation and interpretation where installed
- circuit sensors and controllers
- special system installation requirements
- air conditioning system test equipment and test procedures, including use of:
  - manifold gauges
  - surface probe thermocouples
  - temperature gauges
  - scan tools
  - electrical test equipment
  - electronic leak detectors
  - recovery units
  - vacuum pumps
  - electronic scales
  - other test equipment relevant to the vehicle system
- correct operational sequence of the system
- typical adjustments to correct sequencing variations from specification
- procedures for recording/reporting modifications/alterations and consequences of not recording/reporting
- air conditioning system commissioning procedures

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- cause of the faulty condition in new components and appropriate procedures for rectifying the faulty condition
- appropriate control component connection procedures
- typical test equipment and its application
- common adjustments that can be made to control systems and their effects.

Assessment Conditions

- Assessors must:
  - have vocational competency in installing or modifying mobile plant air conditioning systems at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27028 Diagnose and rectify manual transmissions

Modification History

Release 1. Supersedes and is equivalent to MEM18042C Diagnose and rectify manual transmissions

Application

This unit of competency defines the skills and knowledge required to assess clutch and transmission operation, and repair or replace faulty components.

Testing and assessment of performance would typically require operation of the plant or equipment. A licence may be required and users should check with the relevant authorities.

Where hydraulic clutch assembly is used then unit MEM18020 Maintain hydraulic system components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Assess clutch/ transmission operation**	2.1	Apply principles of clutch and release mechanism types, power flows, gear types and ratios, torque multiplication, synchronising and shifting to assess operation of clutch/transmission assembly
		2.2	Obtain and interpret relevant information prior to any testing
		2.3	Undertake preliminary checks safely to prescribed procedures
		2.4	Isolate faults to component level and determine appropriate corrective action
		2.5	Use test equipment in accordance with SOPs
		2.6	Assess component parts for reuse or replacement
3	**Repair/replace faulty components**	3.1	Determine component wear and clearances using appropriate test equipment and manufacturer recommendations
		3.2	Select replacement components using manufacturers' data
		3.3	Remove and refit components to clutch/transmission assembly using appropriate tools, equipment and

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	techniques
	3.4 Make adjustments using appropriate tooling/equipment and manufacturers' data
	3.5 Verify clutch/transmission assembly is free of excessive noise and operates to specification after work is carried out
	3.6 Record all test and rectification activities according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Manual transmissions include one (1) or more of the following:	• single/multi-plate type • clutch assemblies • counter shaft transmissions • power take-offs • transfer cases

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18042C Diagnose and rectify manual transmissions

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Links

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Assessment Requirements for MEM27028 Diagnose and rectify manual transmissions

Modification History

Release 1. Supersedes and is equivalent to MEM18042C Diagnose and rectify manual transmissions

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to diagnose and rectify manual transmissions
- checking manual transmission for compliance with specifications using appropriate tools, techniques and test equipment
- undertaking calculation and numerical operations associated with diagnosing and rectifying manual transmissions
- testing the clutch/transmission components for compliance to specifications and identifying faulty components by using appropriate testing equipment and identifying components for reuse or replacement
- removing and refitting components to clutch/transmission assemblies and selecting replacement parts using manufacturer catalogues and data
- adjusting clutch and transmission components using appropriate tools, techniques and equipment
- operating the clutch/transmission assembly free of excessive noise and in compliance with specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- principles of operation of a variety of clutches
- functions of the components of a variety of clutches
- principles of operation of manual transmissions
- concepts of gear ratios, torque multiplication and synchronisation
- procedures for:
  - checking clutches and transmissions for correct operation

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  - testing clutches and transmissions
  - checking clutch and transmission components for wear and clearance
  - removing, refitting and adjusting clutch and transmission components
  - recording test and repair activities
- appropriate action to correct the faulty component(s)
- test equipment to be used in checking/testing clutches and transmissions for correct operation and reasons for selection
- tools, techniques and equipment to be used to determine component wear and clearance
- tools, techniques and equipment to be used to maintain and repair clutch and transmission assemblies
- effects of the adjustments on clutch and transmission operation
- clutch/transmission assembly specifications.

Assessment Conditions

- Assessors must:
  - have vocational competency in diagnosing and rectifying manual transmissions at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27029 Maintain wheels and tyres

Modification History

Release 1. Supersedes and is equivalent to MEM18038B Maintain wheels and tyres

Application

This unit of competency defines the skills and knowledge required to assess wheel condition, and repair/replace and maintain the wheel.

It covers the basic maintenance and repair or replacement of wheel rims and to the full range of wheel/tyre assemblies, plant and equipment using appropriate regulations, codes of practice, manufacturer specifications or in-house standards as a guide for assessment repair and assembly.

Where complex rim repairs are required appropriate fitting or welding units should also be selected.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Assess wheel condition**	2.1	Apply rim/tyre designs, constructions, codes, balancing, fastening principles and terminology when assessing wheel condition
		2.2	Assess fastening components for damage and security
		2.3	Recognise abnormal tyre wear and determine cause of fault
		2.4	Recognise unsafe tyre and/or wheel condition and determine remedial action
3	**Rectify and maintain wheel**	3.1	Adhere to safety procedures associated with tyre/wheel removal, handling, inflation, assembly and disassembly and fastening
		3.2	Remove wheels/tyres and replace using appropriate tools, equipment and techniques
		3.3	Apply tools and equipment in accordance with SOPs
		3.4	Perform ballasting and/or inflation of tyres to

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	specification
	3.5 Perform static/dynamic balancing of wheels to specification
	3.6 Rectify rim/tyre/tube faults to specifications, regulations or codes
	3.7 Lubricate wheel bearings to specification
	3.8 Record all service/rectification activities

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18038B Maintain wheels and tyres

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27029 Maintain wheels and tyres

Modification History

Release 1. Supersedes and is equivalent to MEM18038B Maintain wheels and tyres

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists and other applicable reference documents to maintain wheels and tyres
- checking wheels and tyres for compliance to specifications
- inspecting wheel fastening components for damage and security and tyres for abnormal wear
- identifying corrective action to be taken for unsafe tyre and wheel condition
- removing and replacing wheels/tyres using appropriate tools, equipment and techniques
- undertaking ballasting and/or inflation of tyres and balancing wheels to specifications
- identifying and repairing rim, tyres and tube faults to specifications
- lubricating wheel bearings in accordance with specifications
- recording/reporting all service/work activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- design and construction of a variety of rims and tyres
- principles of fastening and balancing of wheels
- relevant codes and standards
- procedures for:
  - checking wheels for damage and secure fastening and reasons that apply
  - removing, handling, inflating, assembling/disassembling and fastening of tyres and wheels and tools, techniques and equipment to be used
  - static and dynamic balancing of wheels and reasons for selecting the chosen tools, techniques and equipment
  - repairing rim, tyre and tube faults and tools, techniques and equipment to be used
  - recording repairs undertaken on rims, tyres and tubes

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    - lubricating wheel bearings and the type of lubricant and their application that applies
- causes of abnormal tyre wear and examples and causes of unsafe tyre and wheel condition
- examples of unrepairable rim, tyre and tube faults.

Assessment Conditions

- Assessors must:
    - have vocational competency in maintaining wheels and tyres at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM27030 Perform engine bottom-end overhaul

Modification History

Release 1. Supersedes and is equivalent to MEM18033B Perform engine bottom-end overhaul

Application

This unit of competency defines the skills and knowledge required to dismantle, clean and assess parts, record and interpret measurements, and recondition components.

It includes cylinder honing using hand held power tools, and replacement of bearings, piston rings and similar activities but not major machining, including crankshaft grinding, cylinder boring and tunnel boring.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **4**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12003	Perform precision mechanical measurement
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations

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MEM18055 Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Dismantle, clean and assess parts**	2.1	Determine the reuse or replacement of crankshaft and piston assemblies based on the characteristics of surface finish and wear patterns
		2.2	Remove engine from plant, remove top-end components and dismantle block assembly according to manufacturer recommendations
		2.3	Check parts for abnormal wear or defects and identify components for reuse or replacement
		2.4	Select appropriate cleaning solution and procedure, clean and store ready for reassembly
		2.5	Rack or set out parts according to their original location in the engine
		2.6	Obtain and record measurements using appropriate measuring equipment
		2.7	Interpret readings regarding replacement or reuse and determine appropriate under/oversize of replacement parts

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
3 **Recondition components**	3.1 Identify ridges, gaps, tapers, ovality and protrusions and take necessary corrective action
	3.2 Assemble components according to manufacturer specifications using appropriate tools and equipment
	3.3 Determine bearing clearances by calculation or direct measurement

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18033B Perform engine bottom-end overhaul

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27030 Perform engine bottom-end overhaul

Modification History

Release 1. Supersedes and is equivalent to MEM18033B Perform engine bottom-end overhaul

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to perform engine bottom-end overhaul
- checking engine for conformance and removing the engine and top-end components and dismantling block assembly
- undertaking calculation and numerical operations to calculate bearing clearances
- checking parts for abnormal wear or defects and identifying components for reuse or replacement
- cleaning parts using appropriate solutions and safety precautions, racking and setting out engine parts according to their original position in readiness for reassembly
- obtaining and recording measurements and interpreting readings for replacement or reuse as being under or over size
- reassembling engine bottom-end components using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of surface finishes and wear patterns as applied to crankshaft and piston assemblies
- specifications of crankshaft and piston assemblies
- reasons for identifying the components for reuse or replacement
- procedures for:
  - dismantling the block assembly and removing the engine from the plant
  - removing the top-end from the engine
  - cleaning engine parts and solution to be applied
  - racking and/or setting out of parts in readiness for reassembly

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    - recording engine measurements
    - removing ridges, gaps, tapers, ovality and protrusions
    - assembling engine bottom ends and precautions to be taken
    - determining bearing clearances and methods to be applied
- tools, techniques and equipment to be used and reasons for selection
- action to be taken when abnormal wear or defects are observed in the engine components
- measuring instruments to be used to measure engine components
- concept of under/over size of replacement parts and the reasons for identifying replacement parts as under or over size
- tools, techniques and equipment required to correct the above faults.

Assessment Conditions

- Assessors must:
    - have vocational competency in performing engine bottom-end overhaul at least to the level being assessed with relevant industry knowledge and experience
    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27031 Perform engine top-end overhaul

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM27031 Perform engine top-end overhaul (Release 1).

Release 1. Supersedes and is equivalent to MEM18034B Perform engine top-end overhaul.

Application

This unit of competency defines the skills and knowledge required to dismantle, clean and assess parts, record and interpret measurements and recondition the cylinder head.

It includes all types of engines and work associated with the reconditioning of cylinder heads, including determining the causes of failures, replacement of inserts, guides and injector sleeves, grinding of valves and seats, and crack/twist/bend testing. The reconditioning of original parts, crack repairs using non-welding techniques and sizing and fitting of replacement parts are also included.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM12024	Perform computations
MEM13015	Work safely and effectively in manufacturing and engineering
MEM14006	Plan work activities
MEM16006	Organise and communicate information
MEM18001	Use hand tools

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MEM18002	Use power tools/hand held operations
MEM18003	Use tools for precision work
MEM18006	Perform precision fitting of engineering components
MEM18055	Dismantle, replace and assemble engineering components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Dismantle clean and assess parts**	2.1	Interpret characteristics of surface finishes and wear patterns associated with valve operating mechanisms and cylinder head
		2.2	Disassemble cylinder head and ancillary components according to manufacturer recommendations
		2.3	Check parts for abnormal wear or defects and identify components for reuse or replacement
		2.4	Select appropriate cleaning solution/procedure, clean parts and store ready for reassembly
		2.5	Rack or set out parts according to their original location in the engine
		2.6	Obtain and record measurements using appropriate

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
			measuring equipment
		2.7	Interpret readings regarding replacement or reuse and determine appropriate under/oversize of replacement parts
3	**Recondition cylinder head**	3.1	Pressure test cylinder head for serviceability
		3.2	Measure and record spring tensions, valve and guide dimensions and surface flatness
		3.3	Remove cylinder head according to manufacturer specifications
		3.4	Use grinding and cleaning equipment in reconditioning the cylinder head
		3.5	Apply operational parameters of cylinder head components in determining whether components are to be reconditioned or replaced
		3.6	Replace injector sleeves, sealing washers, plugs and capping

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

No range of conditions provided for this unit.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM27031 Perform engine top-end overhaul (Release 1).

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Release 1. Supersedes and is equivalent to MEM18034B Perform engine top-end overhaul.

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Assessment Requirements for MEM27031 Perform engine top-end overhaul

Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM27031 Perform engine top-end overhaul (Release 1).

Release 1. Supersedes and is equivalent to MEM18034B Perform engine top-end overhaul.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, charts, lists, drawings and other applicable reference documents to perform engine top-end overhaul
- checking for conformance against specifications and removing the cylinder head from the engine, dismantling cylinder head and ancillary components in accordance with procedures
- undertaking calculation and numerical operations in performing engine top-end overhaul
- checking parts for abnormal wear or defects and identifying components for reuse or replacement
- cleaning cylinder head, ancillary equipment and parts using appropriate solutions and safety precautions, racking and setting out parts according to their original position in readiness for reassembly
- obtaining and recording measurements and interpreting readings for replacement or reuse as being under or over size
- identifying the cylinder head as serviceable or requiring repair/replacement and pressure testing the cylinder head to specifications
- measuring and recording spring tension, valve and guide dimensions and surface flatness
- grinding valves and valve seats using appropriate tools, equipment and techniques
- determining whether components are to be reconditioned or replaced
- replacing all applicable components using appropriate tools, equipment and techniques.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- characteristics of surface finishes and wear patterns as applied to valve operating mechanisms and cylinder heads

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- specifications of valve operating mechanisms and cylinder heads
- procedures for:
  - dismantling cylinder heads and ancillary equipment and tools, techniques and equipment
  - storing parts in readiness for reassembly
  - pressure testing cylinder heads using appropriate tools, techniques and equipment
  - for measuring spring tension, valve and guide dimensions and surface flatness using appropriate tools, techniques and equipment
  - recording cylinder head and valve mechanism measurements
  - removing the cylinder head from the engine using appropriate tools, techniques and equipment
  - grinding valves and valve seats using appropriate tools, techniques and equipment
  - cleaning cylinder heads and ancillary equipment and solutions to be applied
  - reassembling cylinder heads and their components using appropriate tools, techniques and equipment
- cylinder head specifications
- operational parameters of cylinder head components
- precautions to be taken when reassembling cylinder heads.

Assessment Conditions

- Assessors must:
  - have vocational competency in performing engine top-end overhaul at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM27032 Service combustion engines

Modification History

Release 1. Supersedes and is equivalent to MEM18025B Service combustion engines

Application

This unit of competency defines the skills and knowledge required to check and assess engine consumable fluids and components for serviceability, perform the service procedures and report what has been carried out.

Servicing activities include obtaining and dispatching samples for spectrographic or laboratory analysis.

Where interpretation of technical drawings is required unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools/hand held operations is required unit MEM18002 Use power tools/hand held operations should also be selected.

This unit should not be selected if unit MEM18055 Dismantle, replace and assemble engineering components has already been selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering

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MEM16006	Organise and communicate information
MEM18001	Use hand tools

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	**Check and assess items for serviceability**	2.1	Assess engine consumable fluids and components for correct condition
		2.2	Identify replacement fluids/items using manufacturers' data
		2.3	Identify abnormal appearance/condition of engine consumables fluids and components and report to appropriate authority
		2.4	Apply lubricant, cooling system additives and filtering principles in checking and assessing items for serviceability
3	**Perform servicing procedures**	3.1	Drain, flush and replace engine fluids with correct fluid and/or additives to the correct level/concentration according to manufacturer recommendations
		3.2	Remove engine consumable components and replace according to manufacturer recommended procedures
		3.3	Ensure engine is free of lubricant, water and air leaks

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	after servicing work
	3.4 Secure hoses, wiring and ducts and keep clear of moving parts after servicing work, where required
	3.5 Make minor running adjustments to specification
	3.6 Obtain test samples of fluids from system as determined by SOPs
	3.7 Record servicing activities on report sheet/proforma, or provide accurate oral report

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Engine consumable fluids and components include one (1) or more of the following:	• filters • coolants • lubricants • hydraulic and other fluids • additives • simple drive belts • coolant hoses
Running adjustments include one (1) or more of the following:	• belt tensions • shroud clearances

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18025B Service combustion engines

Links

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Assessment Requirements for MEM27032 Service combustion engines

Modification History

Release 1. Supersedes and is equivalent to MEM18025B Service combustion engines

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- assessing engine consumable fluids and components for levels and serviceability and identifying replacement consumables and components using manufacturers' data
- identifying and reporting on fluids and items which have abnormal appearance and flushing and cleaning engine of any residual fluids according to procedures
- undertaking numerical operations and calculations for servicing combustion engines
- removing/replacing engine fluids with correct fluids and/or additives to correct levels
- checking engine for leaks after servicing and, where required, securing all wiring, hoses and ducts free of moving parts
- carrying out minor running adjustments
- obtaining test samples of fluids for further testing
- recording and reporting service activities in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- common defects that can be identified from the appearance of fluids and items
- procedures for:
  - reporting items/fluids with abnormal appearance
  - draining and flushing fluids from the engine, including the reasons for ensuring any residual/spilt fluids are removed from the engine
  - removing/replacing engine consumable fluids and components
  - checking serviced engines for leaks
  - taking test samples
  - reporting service activities
- principles of operation of the lubrication and cooling systems
- function of filters

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- purpose of a range of additives and correct proportions to be used
- spilt containment and spilt kits
- appropriate grade and type of replacement fluid
- methods of fastening/securing wires, hoses and ducts
- specifications and procedures for undertaking minor running adjustments.

Assessment Conditions

- Assessors must:
  - have vocational competency in servicing combustion engines at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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MEM27033 Perform advanced equipment testing and diagnostics on mobile plant and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18073A Perform advanced equipment testing and diagnostics on mobile plant and equipment

Application

This unit of competency defines the skills and knowledge required to obtain and interpret information to diagnose mobile plant and equipment faults, determine the cause, and make recommendations, and includes the use of electronic and analog diagnostic tools.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **B**

Unit Weight: **8**

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM16008	Interact with computing technology
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18055	Dismantle, replace and assemble engineering components
MEM27006	Diagnose and rectify batteries, low voltage sensors and circuits
MEM27016	Diagnose and maintain electronic controlling systems on mobile and stationary plant

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Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job requirements**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	**Obtain information on mobile plant and equipment performance**	2.1	Access and interpret job-related information and use information management systems to access data on plant and equipment performance
		2.2	Review previous service records to access data on plant and equipment performance
		2.3	Review equipment systems operation, testing and adjusting procedure and identify troubleshooting procedure
		2.4	Identify hazards associated with plant and equipment tests
3	**Identify equipment fault/s**	3.1	Interpret data from information management system and determine fault symptoms, including carrying out a visual inspection on equipment operation
		3.2	Install all test equipment at the correct test point locations and conduct performance tests, as required
		3.3	Analyse information from tests and test equipment and identify fault
		3.4	Plot data and record on performance analysis report forms

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
4	**Determine cause of fault/s and make recommendations**	4.1	Identify possible causes and conduct diagnostic tests to confirm cause
		4.2	Analyse test result and compare with specifications
		4.3	Locate cause of fault and document
		4.4	Make recommendations for repair and implement rectification strategy
5	**Check and document repairs**	5.1	Check repairs for completion
		5.2	Re-test equipment to ensure compliance
		5.3	Prepare and complete service report and complete required documentation in accordance with procedures

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Mobile plant faults occur within one (1) or more of the following:	• hydraulics • engine • power train • electronic systems

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hazards include one (1) or more of the following:	• ventilation hazards, including battery gas leaks and (freon) paint emission • excessive noise • fluid spillage • electrical hazards from generator sets and water • lifting hazards caused by the removal and replacement of heavy components (e.g. engines and transmissions) • hydraulic hazards (e.g. high oil pressure and temperature) • drive trains hazards (e.g. tail shaft wind up) • fire hazards from the activation of fuel and temperature
Information management systems include one (1) or more of the following:	• retrieving test data from the service information system (SIS) • equipment management systems • factory passwords • finding test data through, microfiche and SIS • obtaining relevant flash file information • finding full load settings (FLS) and full torque settings (FTS), SIS or similar • using the dynamometer and windows performance analysis reporting programs • producing performance analysis report
Test equipment includes one (1) or more of the following:	• dynamometer • electronic technician • multimeter • flow meter • pressure gauges • communication adaptors • scroll box • stop watch

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Performance tests include one (1) or more of the following:

- rocker checks for oil
- fluid level checks
- fuel and cooling system checks
- emergency shutdown operation checks
- final walk around inspection
- manual and/or electronic tests of equipment and/or components
- cylinder cut out tests
- solenoid tests
- cycle times
- sensor tests
- lubrication pressure checks
- leak checks
- power checks using the dynamometer program, engine performance tools, transmission and hydraulic test equipment
- checks on alignments between components

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18073A Perform advanced equipment testing and diagnostics on mobile plant and equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM27033 Perform advanced equipment testing and diagnostics on mobile plant and equipment

Modification History

Release 1. Supersedes and is equivalent to MEM18073A Perform advanced equipment testing and diagnostics on mobile plant and equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting charts, lists, manufacturer specifications, drawings, personnel accounts/descriptions, history, log books and job records and obtaining and accessing relevant data manually or by electronic means on mobile plant and equipment performance
- identifying hazards associated with mobile plant and equipment and implementing appropriate risk control measures and procedures
- identifying faults by checking equipment for compliance with specifications using appropriate test equipment and appropriate fault-finding techniques
- identifying possible causes for fault and making recommendations for rectifying faults using a rectification strategy, including referral, replacement or dispatch to other personnel
- undertaking calculations and numerical operations associated with advanced equipment testing and diagnostics on mobile plant and equipment
- checking equipment for compliance with specifications after rectification of faults
- documenting all findings and outcomes in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- tests to be conducted to diagnose faults at equipment and component level
- sources of information available to assist in fault finding
- uses and parameters of information management systems
- required rectification for equipment faults
- practices and procedures in root cause analysis
- equipment performance specifications
- documentation requirements.

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Assessment Conditions

- Assessors must:
  - have vocational competency in performing advanced equipment testing and diagnostics on mobile plant and equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM30012A Apply mathematical techniques in a manufacturing engineering or related environment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers applies the *concepts of mathematics* to appropriate and simple engineering situations within the individual's area of engineering expertise.

Application of the Unit

Application of the unit	This unit applies to technician level work that requires basic algebraic, trigonometric and statistical knowledge and skill. **Band**: **0** **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Use concepts of arithmetic in the solution of engineering problems	1.1. Units of physical quantities are converted to facilitate engineering calculations. 1.2. Calculations are performed to solve problems involving rational and irrational numbers. 1.3. Scientific notation is used to represent numbers. 1.4. Calculations are checked for reasonableness using estimating and approximating techniques.
2. Solve engineering problems involving algebraic expressions with one independent variable	2.1. Algebraic expressions are manipulated using mathematical operations in their correct order.
3. Use two-dimensional geometry to solve practical problems	3.1. Angles expressed in degrees are correctly converted to radians and vice versa. 3.2. The perimeter, area, length and angles of a range of two-dimensional figures are correctly calculated. 3.3. The volume and surface area of complex figures are correctly calculated. 3.4. Points identified in terms of cartesian coordinates can be converted to polar coordinates and vice versa.
4. Use trigonometry to solve practical	4.1. Basic trigonometry functions are used to calculate the lengths of the sides of right-angled triangles.

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ELEMENT	PERFORMANCE CRITERIA
problems	4.2. Inverse trigonometry functions are used to determine angles in a right-angled triangle given the lengths of two sides. 4.3. The sine rule is used to determine the lengths of the sides of acute and obtuse angled triangles given one side and two angles. 4.4. The cosine rule is used to determine the lengths of the sides of acute and obtuse angled triangles given two sides and one angle.
5. Graph linear functions	5.1. Linear functions are solved graphically and equations of straight lines are determined from the slope and one point, or two points. 5.2. Two linear functions are solved simultaneously both algebraically and geometrically. 5.3. The length and mid point of a line segment are determined.
6. Solve quadratic equations	6.1. Quadratic equations are solved. 6.2. Simultaneous linear and quadratic equations are solved.
7. Perform basic statistical calculations	7.1. Mean, median and mode are calculated from given data. 7.2. Standard deviation is calculated and interpreted employing graphical representation.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

Look for evidence that confirms skills in:
• using and applying mathematical formulas:
  • logical thinking
  • problem solving
  • calculating
  • applying statistics

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REQUIRED SKILLS AND KNOWLEDGE
• using computer numerical methods • drawing graphs
Required knowledge
Look for evidence that confirms knowledge of: • transposing and evaluating formulae • polynomials • straight line coordinate geometry • introduction to indices • introduction to trigonometry • circular functions • trigonometry of oblique triangles • trigonometric identities • introduction to functions and their graphs

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to apply mathematical skills and knowledge to simple engineering applications. Evidence from tasks and projects should/may be used to complement and demonstrate integration of competency.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic

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EVIDENCE GUIDE	
	workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying mathematical concepts to engineering applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Concepts of mathematics	Include arithmetic, algebraic expressions with one independent variable, two-dimensional geometry, trigonometry, linear functions, basic quadratic functions, basic statistical methods

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RANGE STATEMENT	
Correct order	Refers to the correct procedure when expanding brackets, factorising algebraic expressions, factorising quadratic expressions, simplifying algebraic fractions, transposing formulae, solving simple one variable equations, finding the quotient and remainder given a linear division
Complex figures	May include cones, pyramids, spheres, frustums and intersections of figures singularly or in combination

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering technician

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MEM30025A Analyse a simple electrical system circuit

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers analysing a simple circuit by identifying the function and operation of the circuit and circuit components contained within approved manufactured products.

Application of the Unit

Application of the unit	This unit applies to all manufacturing environments. It covers analysis of existing circuits against specifications only and does not extend to determining modifications to circuits. This unit does not cover the skills involved in direct measuring of values requiring connecting or disconnecting of circuits and components covered by licensing requirements. Where such values are required they are to be obtained through the assistance of appropriately licensed personnel or through undertaking the specified training for the appropriate licence. Work is conducted in accordance with regulatory and legislative requirements in each State and Territory Work is carried out under supervision. **Band**: **0** **Unit Weight**: **0**

Licensing/Regulatory Information

Refer to Application of the Unit

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Pre-Requisites

Prerequisite units		
Path 1	MEM12024A	Perform computations

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish function and purpose of selected circuit	1.1. All relevant drawings, specifications, manuals and documentation are obtained and interpreted in accordance with workplace procedures. 1.2. Circuit and component installation is observed where required to establish function and purpose. 1.3. Safety procedures to be followed are determined in conjunction with supervisors and in accordance with legislative and regulatory requirements. 1.4. Appropriate personnel are consulted with to establish job requirements.
2. Extract a circuit diagram from	2.1. Appropriate components and assemblies are identified.

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ELEMENT	PERFORMANCE CRITERIA
existing drawings and documentation	2.2. Where required, components and/or materials are identified from supplier/manufacturer catalogues. 2.3. Circuit diagram is extracted. 2.4. Drawing conventions and symbols are used in the diagram in accordance with codes and workplace procedures.
3. Analyse the circuit for electrical characteristics	3.1. Functions of the circuit and components are compared against design characteristics and operational specifications.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- calculating
- reading and interpreting specifications and drawings
- drawing to scale
- analysing
- planning and sequencing operations
- checking and clarifying task-related information
- checking for conformance to specifications

Required knowledge

Look for evidence that confirms knowledge of:

- safe work practices and procedures
- hazard and control measures associated with analysing the function of a simple electrical system circuit
- dangers and safety precautions:
  - electrical hazards
  - earthing and insulation
- The function of the following components:
- resistors:
  - fixed (composition and wire wound)

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REQUIRED SKILLS AND KNOWLEDGE

- variable (rheostats, potentiometers and trimmers)
- non-linear (thermistors)

- capacitors:
  - fixed (ceramic, plastic and electrolytic)
  - variable
  - magnetic
  - transformers (AF, RF and power)
  - chokes
  - relays
  - contactors
  - rectifiers
  - smoothing filters
  - voltage regulators and feedback
- basic physics:
  - conductors
  - insulators
  - semiconductors
  - current flow
  - voltage
  - resistance
  - colour code
  - power rating
  - Ohm's Law
  - electrical units
  - power in electrical circuits
- protection methods:
  - fuses
  - circuit breaking
  - safety interlocks
  - earthing - personnel safety
- a.c. circuits:
  - series and parallel a.c. circuits
  - power in a.c. circuits
- power supplies:
  - transformers
  - rectifiers
  - smoothing filters
  - voltage regulators and feedback

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REQUIRED SKILLS AND KNOWLEDGE
• function and operation of a simple low voltage d.c. power supply • function and operation of the transformer in a simple low voltage d.c. power supply, including the significance of the turns ratio • function in a simple low voltage d.c. power supply of rectifiers including the significance of the diode characteristics, for both half and full wave types • operation of smoothing filters in a simple low voltage d.c. power supply • operation of simple zener diode type voltage regulators in a simple low voltage d.c. power supply • feedback

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to analyse the functions and components of a simple electrical system circuit. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, i.e. the candidate is not in productive work, an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication,

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EVIDENCE GUIDE	
	materials handling, recording and reporting associated with analysing a simple electrical system circuit or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Components and assemblies	Can include: • resistors - fixed (composition and wire wound), variable (rheostats, potentiometers and trimmers), non-linear (thermistors) • capacitors - fixed (ceramic, plastic and electrolytic), variable, magnetic, transformers (AF, RF and power), chokes, relays, contactors, rectifiers, smoothing filters, voltage regulators and feedback

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Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering technician

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MEM50001 Classify recreational boating technologies and features

Modification History

Release 1. Supersedes and is equivalent to MEM50001B Classify recreational boating techniques and features

Application

This unit of competency defines the skills and knowledge required to recognise vessel features, fittings and fixtures; correctly identify power and transmission systems; describe system operating purpose; and use appropriate terminology.

This unit applies to the identification of vessel types and to the classification of vessels according to their main features and relates to recreational vessels and covers engine and sail powered as well as rowed vessels and the depth of knowledge required is sufficient to be able to identify one vessel from another and be able to describe its method of propulsion where applicable.

Detailed features of hulls, power plants and trailers are covered by other competencies.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering

Competency Field

Boating services

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify vessel configurations used in boating applications**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify hull forms and superstructure features
		1.4	Match hull designs to normal vessel application
		1.5	Identify construction materials
2	**Identify and describe the functions of the major systems of a recreational vessel and trailer**	2.1	Identify systems used for vessel propulsion, steering, navigation, communication, services and appliances and explain functions
		2.2	Identify trailer components and explain functions
3	**Confirm vessel origins**	3.1	Locate vessel identification plates and registration tags
		3.2	Locate and record engine number, model designation and other details
		3.3	Use identification data to confirm vessel year of manufacture, refurbishment (and/or registration)
4	**Identify configuration of motorised propulsion systems**	4.1	Locate and categorise vessel power plant(s) for fuel system, number and configuration of cylinders
		4.2	Identify engine cooling and control systems and categorise
		4.3	Identify and categorise engine lubricating systems
		4.4	Categorise vessel propulsion (transmission) system for type and operation
		4.5	Describe operating cycles and cylinder configuration for 2 stroke, 4 stroke, diesel and petrol powered engines

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Trailer components include one (1) or more of the following:

- winching
- coupling
- load securing
- braking
- suspension
- electrical systems

Construction materials include one (1) or more of the following:

- glass reinforced plastics
- composite materials
- aluminium
- steel
- timber:
  - clinker
  - carvel
  - cold moulded
  - plywood sheeted

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50001B Classify recreational boating techniques and features

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Links

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Assessment Requirements for MEM50001 Classify recreational boating technologies and features

Modification History

Release 1. Supersedes and is equivalent to MEM50001B Classify recreational boating techniques and features

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- discerning differences in hull shapes and types as well as construction materials, propulsion and steering systems, power plants, ancillary systems, fittings and fastenings
- locating, reading and interpreting information on identification and compliance plates, registration tags, engine and other component identification numbers
- identifying different types of power plants, engine cooling and lubrication systems and transmission types.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- typical hull shapes and design features of recreational sail, powered and non-powered craft, including hard chine, round bilge, planing hulls, multi-hulls, inflatables, rigid and swing keel and centre board
- typical superstructure configurations and general deck layouts of recreational sail, powered and non-powered craft, including fully open, flush decks, bow riders, half cabins and fly bridges
- typical sail and mast arrangements for recreational sailing craft, including mast configurations, basic rigging arrangements and sail types, including mainsail, genoa and spinnaker
- construction materials, including glass reinforced plastics and composite materials, aluminium and steel and types of internal combustion engines used for inboard and outboard propulsion systems, including two and four cycle; different cylinder layouts and different fuel types, including petrol and diesel, liquid or air cooling, starting systems and lubrication methods
- propulsion systems, including single and multi-screw, jet drives, clutches and gearboxes, including stern drives and outboard drives as well as vee drives and bow thrusters

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- steering systems, including tillers, rods/chains/cable drives, hydraulic and rudder types
- features and functions of attached navigation and communication devices, including navigational lighting, compass, global positioning system (GPS), radar, depth sounder, logs, radios and audible alarms
- features and functions of trailer components, including winches, couplings, load securing, braking, suspension and electrical systems
- use of information on identification and compliance plates, registration tags, engine and other component identification numbers.

Assessment Conditions

- Assessors must:
  - have vocational competency in classifying recreational boating techniques and features at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50002 Work safely on marine craft

Modification History

Release 1. Supersedes and is equivalent to MEM50002B Work safely on marine craft

Application

This unit of competency defines the skills and knowledge required to identify risks and safely work on and move around vessels – for sales, service or repair – on and out of the water and applies to recreational vessels in both land and water environments and in workplaces in which vessels are built, repaired, stored, sold and transported.

This unit could be assessed in conjunction with unit MEM13002 Undertake work health and safety activities in the workplace and unit MEM13003 Work safely with industrial chemicals and materials.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering

Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Identify safe access methods and working**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	platforms		requirements at all times
		1.3	Use appropriate access methods to gain access to the work location
		1.4	Inspect work platforms to confirm that they are appropriate for the purpose, are located in a correct manner and comply with any regulatory controls
2	**Move around and work safely on recreational vessels**	2.1	Identify risks and hazards from observation, including confined spaces, and identify workplace approved risk controls
		2.2	Select work methods and tools appropriate for the task
		2.3	Identify and use appropriate engineering controls
		2.4	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.5	Use appropriate warning signs and signals
		2.6	Minimise, control and dispose of work residues in accordance with SOPs
		2.7	Maintain worksite in a clean and tidy state using appropriate housekeeping methods
3	**Follow emergency procedures for incidents in the marine environment**	3.1	Use appropriate responses in reaction to incidents and accidents
		3.2	Use communication systems and methods to convey emergency messages
		3.3	Follow drills for fire, explosion, toxic/dangerous spills and leakage, personal illness or injury, man overboard, collision or vessel damage

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Access to the work location includes one (1) or more of the following:	• gang planks • hatches • access ladders • bosun's chairs • rigging
Work platforms include one (1) or more of the following:	• purpose built work platforms • mobile and prefabricated scaffold • elevated work platforms
Engineering controls include one (1) or more of the following:	• ventilation and extraction systems • dust control devices • screens
PPE includes one (1) or more of the following:	• goggles/face shields • masks or respirators • air supplied or self-contained helmets • appropriate footwear, gloves and appropriate garments • hearing protection • fall arrest devices • UV protection
Workplace housekeeping includes the following:	• covering/protecting surfaces prior to starting work • returning materials/equipment to storage area • sweeping and cleaning • containment and mopping of spills • appropriate disposal of waste products
Communication systems and methods include one (1) or more of the following:	• direct voice • megaphone • flares • radio • hand signals • telephone

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- flags
- computer
- EPIRB

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50002B Work safely on marine craft

Links

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Assessment Requirements for MEM50002 Work safely on marine craft

Modification History

Release 1. Supersedes and is equivalent to MEM50002B Work safely on marine craft

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, appropriate emergency procedures, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting safety signage, labelling and placards; carrying out risk assessment and identifying work health and safety (WHS) hazards and risks; and implementing appropriate risk control measures and procedures
- selecting and using the most appropriate engineering controls, including proper manual handling techniques and personal protection equipment (PPE) suitable to the task being performed
- implementing appropriate workplace housekeeping methods
- performing emergency procedures for incidents in the marine environment
- using communication systems and methods to convey emergency messages.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- testing and maintenance of PPE
- dangerous goods classification and labelling/placarding
- inherent hazardous properties of the chemicals used
- interpretation of the relevant safety data sheets (SDS)
- basic fire-fighting procedures
- site-specific emergency plan procedures
- spill confinement procedures
- dangerous occurrence (near miss) reporting procedures
- regulatory and legislative requirements.

Assessment Conditions

- Assessors must:

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  - have vocational competency in working safely on marine craft at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50003 Follow work procedures to maintain the marine environment

Modification History

Release 1. Supersedes and is equivalent to MEM50003B Follow work procedures to maintain the marine environment

Application

This unit of competency defines the skills and knowledge required to conduct work on vessels or equipment without adversely affecting the quality of the marine environment and applies to the protection of marine environments when working on or around recreational vessels and in workplaces in which vessels are built, repaired, stored, sold and transported.

Where specific coverage of the limitation, capture and disposal of pollutants in the marine environment is required unit MEM50004 Maintain quality of environment by following marina codes should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering

Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Follow workplace**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	procedures	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Observe workplace and surroundings and use equipment and practices to minimise environmental damage
		1.5	Complete assigned housekeeping duties following approved workplace procedures
		1.6	Identify any damaged equipment, tag for maintenance and notify appropriate personnel
		1.7	Maintain schedules and records for housekeeping duties
2	**Demonstrate spill clean-up procedures**	2.1	Identify source of spill and stop, if possible, and make notification to appropriate personnel
		2.2	Identify appropriate materials to contain spills, including booms, portable bunding, absorbent materials and drain blocks
		2.3	Clean up spills following workplace procedures
		2.4	Dispose of waste in appropriate locations and containers
3	**Assist the business to maintain the quality of the environment**	3.1	Follow business environment policy
		3.2	Avoid excessive idling and revving of engines
		3.3	Ensure noisy activities are located away from neighbours, where possible
		3.4	Use noise suppression procedures, where available
		3.5	Use dust control and waste containment measures
		3.6	Collect and dispose of waste in accordance with legislative requirements

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Surroundings include one (1) or more of the following:	• noting location of drains and interceptors • bunded work and storage areas • recyclable, solid and hazardous waste storage • emergency equipment and spill kits • areas where work may impact on the environment
Workplace housekeeping includes the following:	• covering/protecting surfaces prior to starting work • returning materials/equipment to storage area • sweeping and cleaning • containment and mopping of spills • appropriate disposal/discharge of waste products

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50003B Follow work procedures to maintain the marine environment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50003 Follow work procedures to maintain the marine environment

Modification History

Release 1. Supersedes and is equivalent to MEM50003B Follow work procedures to maintain the marine environment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- locating and interpreting relevant workplace procedures and assessing work activities that can have an impact on the environment
- handling materials, including fuels, oils, protective coatings, and cleaning products
- identifying sources of potential pollution, minimising risks and containing pollution
- implementing appropriate workplace housekeeping methods
- demonstrating procedures for cleaning up spills and disposing of waste
- following business environmental policy and collecting and disposing of waste products in accordance with regulatory and legislative requirements.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- pollutants and their sources
- procedures to minimise risk of pollution
- procedures for containment of pollution
- procedures for cleaning up spills and disposing of waste
- applicable environmental legislation and regulatory requirements.

Assessment Conditions

- Assessors must:
  - have vocational competency in following work procedures to maintain the marine environment at least to the level being assessed with relevant industry knowledge and experience

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    - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50004 Maintain quality of environment by following marina codes

Modification History

Release 1. Supersedes and is equivalent to MEM50004B Maintain quality of environment by following marina codes

Application

This unit of competency defines the skills and knowledge required for workers in the industry controlling pollution through the limitation, capture and disposal of pollutants in the marine environment when working on or around recreational vessels and relates to workplaces in which vessels are built, repaired, stored, sold and transported.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **A**

Unit Weight: **1**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM50003	Follow work procedures to maintain the marine environment

Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Determine job**	1.1	Follow standard operating procedures (SOPs)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	List tasks to be conducted or consult work instructions to establish work requirements
		1.5	Inspect vessel to be maintained visually to establish any particular potential pollutants
		1.6	Identify potential pollutants that may be produced as a result of the work
2	**Select work area and method**	2.1	Identify possible work areas for the work and select to conform to marina/slipway codes and local environmental regulations and to minimise risk of pollution
		2.2	Select work method, equipment and materials to minimise impact on the environment
		2.3	Identify pollution control measures and implement
3	**Dispose of potential pollutants**	3.1	Classify potential pollutants, separate and collect appropriate to the recycling, treatment or storage system adopted by the business
		3.2	Dispose of collected pollutants in accordance with regulatory requirements and workplace procedures
4	**Support implementation of marina and slipway environment management plans**	4.1	Follow workplace designated procedures for marina and slipway management
		4.2	Communicate observations of the effects of the management plan and recommend implementation improvements to appropriate personnel
		4.3	Participate in the implementation of the environment management plan

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Pollutants include one (1) or more of the following:	• wastewater, including bilge/black/grey/storm/cleaning water • paint, including fumes and overspray • anti-fouling flakes or solution • sand or grit from blasting/cleaning • fuel or oil spills • discharges of emulsified oil • domestic waste • noise • smoke and fumes

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50004B Maintain quality of environment by following marina codes

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50004 Maintain quality of environment by following marina codes

Modification History

Release 1. Supersedes and is equivalent to MEM50004B Maintain quality of environment by following marina codes

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and conforming with marina/slipway codes and local environmental regulations to minimise risk of pollution
- communicating observations of the effects of the management plan and recommending implementation improvements
- identifying potential sources of pollution
- identifying work tasks and appropriate area to perform work
- minimising risks of pollution and containing using appropriate measures
- collecting and disposing of pollutants according to SOPs
- following workplace procedures for marina and slipway management.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- communication procedures
- marina and slipway environmental management
- identification of pollutants
- procedures to minimise risk of pollution
- procedures for containment of pollution
- applicable environmental legislation
- applicable marina codes and regulations.

Assessment Conditions

- Assessors must:

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  - have vocational competency in maintaining quality of environment by following marina codes at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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MEM50005 Refuel vessels

Modification History

Release 1. Supersedes and is equivalent to MEM50005B Refuel vessels

Application

This unit of competency defines the skills and knowledge required to refuel recreational vessels and appliances in both land and water environments and relates to workplaces in which vessels are built, repaired, stored, sold and transported.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM50002	Work safely on marine craft
MEM50003	Follow work procedures to maintain the marine environment

Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Match fuels and additives to marine**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS)

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	applications		requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Select fuels to match the engine or appliance
		1.5	Consider alternative fuel applications
		1.6	Select fuel additives and lubricants based on vessel/appliance use and manufacturer requirements
2	**Identify fuel handling risk, precautions and regulatory requirements**	2.1	Identify dangers of volatile fuel liquids and vapours
		2.2	Identify precautions for minimising risks associated with volatile liquids in workplace procedures
		2.3	Identify procedures to prevent build up of volatile vapours and gases
		2.4	Identify regulatory requirements for refilling portable fuel containers
3	**Identify safety and environmental requirements for fuel refill areas**	3.1	Use correct locations for refuelling activities
		3.2	Apply workplace strategies/procedures to limit danger from static electricity and other sources of ignition
		3.3	Identify protection systems that provide physical barriers to minimise accidental collision with fuelling facilities and use to prevent spills entering drains or the water environment
		3.4	Use appropriate ventilation
		3.5	Identify signage for public safety needs and Hazchem requirements
		3.6	Identify emergency stops and shut-off devices and describe activation methods
4	**Refill fuel containers**	4.1	Refill portable liquid fuel tanks and appliances
		4.2	Refill gas cylinders
		4.3	Refill on-board fuel tanks

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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
		4.4	Check fuel levels for each method of storage
		4.5	Identify emergency procedures for leaks, spills and fire
		4.6	Replace gas cylinders if required
5	**Contain and clean up spills**	5.1	Identify potential for spills
		5.2	Follow procedures for notification of spills
		5.3	Follow workplace procedures to contain spill and minimise any environment or safety dangers
		5.4	Identify clean up equipment and use

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Fuels include one (1) or more of the following:	• petrol (gasoline), including premixed two stroke fuel • diesel (distillate) • kerosene • methylated spirits • lighter fluid/white spirits • liquefied petroleum gas (LPG)
Appliances include one ((1) or more of the following:	• stoves • refrigerators • heaters • lights

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Replacement of gas cylinders includes the following:	• turn off appliances and pilot light • vent gas lines in a safe manner after closing gas valves • leak test fittings after fitting cylinders • refit and adjust bottle restraining devices • following emergency procedures for leaks and fire
PPE includes one (1) or more of the following:	• goggles/face shields • masks or respirators • gloves and appropriate clothes/garments
Contain spill includes one (1) or more of the following:	• bunding and drain covers • chemical dispersal agents • absorptive materials • containment booms and portable bunding

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50005B Refuel vessels

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50005 Refuel vessels

Modification History

Release 1. Supersedes and is equivalent to MEM50005B Refuel vessels

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying correct fuel for the application
- identifying correct additives and lubricant for the application
- using appropriate personal protective equipment (PPE)
- sourcing and interpreting Hazchem (or similar) requirements and working safely with fuels and lubricants
- refilling fuel containers and tanks and checking fuel levels using gauges, dipsticks and sight tubes
- refilling and, if required, replacing gas cylinders and carrying out leak test in accordance with procedures
- containing spills using containment and clean up procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of PPE
- different fuels and their applications
- personal and environmental dangers associated with fuels and refuelling/filling
- risk minimisation
- selection of appropriate fire-fighting equipment
- reduction of vapours
- correct handling of gas cylinders, including condition and lifespan
- dealing with spills
- emergency procedures
- regulatory and legislative requirements.

Assessment Conditions

- Assessors must:

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  - have vocational competency in refuelling vessels at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50006 Check operational capability of marine craft

Modification History

Release 1. Supersedes and is equivalent to MEM50006B Check operational capability of marine craft

Application

This unit of competency defines the skills and knowledge required to conduct basic checks on the operational condition of engine and sail powered recreational vessels in or out of the water and relates to workplaces in which vessels are built, repaired, stored, sold and transported.

The scope of the unit is limited to identifying and reporting that a vessel is not of its 'normal' appearance at rest on its mooring or berth, or after being brought out of the water and includes basic operational checks similar to those routinely performed by machinery or vehicle operators.

This unit does not include an assessment of seaworthiness or durability but it does cover watertight integrity and the information would be reported to a supervisor or manager who would determine any further action.

Where operational checking of sails and sails systems is required unit MEM50007 Check operational capability of sails and sail operating equipment should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM50002	Work safely on marine craft

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Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Inspect hull, fittings and safety equipment**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Inspect hull bungs and sea cocks for security and integrity
		1.4	Check hull condition for holes, cracks and deterioration, and extent of marine growth
		1.5	Check fittings and mountings for security and excessive corrosion
		1.6	Complete reports of hull and fitting condition on approved workplace documentation and/or report verbally
		1.7	Check vessel safety equipment availability against identified requirements and determine condition and report, as required
2	**Check operating systems**	2.1	Check propulsion, electrical power (including battery), steering, cable and line handling and domestic systems for correct fluid levels, fuel state, lubrication, and visually check for mechanical condition and leaks
		2.2	Check communication equipment for operational status
3	**Inspect cabin and domestic systems**	3.1	Inspect cabin fittings for security and integrity
		3.2	Check cabin and fittings for holes, cracks and deterioration
		3.3	Check fittings and mountings for security and condition
		3.4	Operate domestic systems to ensure serviceability
		3.5	Complete reports of cabin and fittings condition on approved workplace documentation and/or report

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	verbally

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Hull and fittings include the following:	• surface finish and general condition of the hull inside and out as well as any fittings both above and below the water line where visible
Safety equipment includes one (1) or more of the following:	• flotation devices • communication systems including lights • flares • pumps and bailers • anchor • halyards and chains • emergency position-indicating radio beacons (EPIRBs) • fire extinguishers • torches • lifelines
Operating systems include the following:	• mechanical propulsion systems • communication systems • steering systems • pumping systems • winches and cable handling equipment • ultra low voltage electrical systems operating at 12 or 24 volts d.c.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Domestic systems include one (1) or more of the following:	• water supply and heating • air conditioning and heating • lighting • cooking • refrigeration • sewage and sullage • entertainment systems

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50006B Check operational capability of marine craft

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50006 Check operational capability of marine craft

Modification History

Release 1. Supersedes and is equivalent to MEM50006B Check operational capability of marine craft

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking the general condition of hulls, decks, cabins fixtures and fittings and safety equipment
- checking operational condition of operating and domestic systems
- checking engines and other equipment for leaks and performing visual inspection of batteries
- checking and correcting fluid levels and lubrication
- completing all reports in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- general methods of determining condition of hulls, decks, cabins, fittings and fixtures and safety equipment
- methods of determining condition of operating and domestic systems in terms of whether they operate as required
- battery inspection requirements
- information collation methods to provide a written and/or verbal report.

Assessment Conditions

- Assessors must:
  - have vocational competency in checking operational capability of marine craft at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50007 Check operational capability of sails and sail operating equipment

Modification History

Release 1. Supersedes and is equivalent to MEM50007B Check operational capability of sails and sail operating equipment

Application

This unit of competency defines the skills and knowledge required to conduct basic checks on vessel sail systems of recreational vessels in both land and water environments and relates to workplaces in which vessels are built, repaired, stored, sold and transported.

The scope of the unit is limited to identifying and reporting on the general condition of the sails and their equipment and identifying potential problems that can be easily discerned and includes basic operational checks similar to those routinely performed by machinery or vehicle operators.

This unit does not include an assessment of seaworthiness or durability and the information would be reported to a supervisor or manager who would determine any further action.

Where operational checking of other vessel components is required unit MEM50006 Check operational capability of marine craft should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM50002	Work safely on marine craft

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Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Inspect mast(s), boom(s), spars and fittings**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Inspect masts, booms and spars for security and integrity
		1.4	Inspect fixed rigging for security and excessive corrosion
		1.5	Check fittings and mountings for security and excessive corrosion
2	**Inspect sail condition**	2.1	Inspect sails for tears, rot and deterioration
		2.2	Inspect sail runners, cleats and reinforcing points
		2.3	Complete reports of sails and fittings condition on approved workplace documentation and/or report verbally
		2.4	Stow sails stowed in a correct manner after inspection
3	**Check halyards, sheets, ropes and winches**	3.1	Inspect halyards, sheets, ropes, cables and winches for security and integrity
		3.2	Secure halyards, sheets, ropes and cables and/or stow correctly
		3.3	Check winches and capstans for operation, lubrication and condition
		3.4	Check fittings and mountings for security and condition
		3.5	Complete all reports and document all findings in accordance with workplace procedures

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Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Masts, booms and spas include one (1) or more of the following:	• wood • aluminium • composite materials
Halyards, sheets, ropes, cables and winches include the following:	• halyards • ropes • wires • cables • shackles • turning blocks • electric and hand powered winches • self-steer systems • self-furling sail systems

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50007B Check operational capability of sails and sail operating equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50007 Check operational capability of sails and sail operating equipment

Modification History

Release 1. Supersedes and is equivalent to MEM50007B Check operational capability of sails and sail operating equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking the general condition of masts, booms and spars for security and integrity
- checking the general condition of sails for tears, rot and deterioration in accordance with procedures
- checking the general condition of sail hoisting and trimming equipment for security and integrity
- stowing sails and ropes in a correct manner
- completing all reports in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- general methods of determining condition of masts, booms and spars
- methods of determining condition of sails and hoisting/trimming equipment in terms of whether they operate or not, are frayed or showing signs of distress
- information collation methods to provide a verbal and/or written report.

Assessment Conditions

- Assessors must:
  - have vocational competency in checking operational capability of sails and sail operating equipment at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires

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- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50008 Carry out trip preparation and planning

Modification History

Release 1. Supersedes and is equivalent to MEM50008B Carry out trip preparation and planning

Application

This unit of competency was developed by the National Marine Safety Committee (NMSC) and defines the skills and knowledge required to plan and prepare for a safe boating trip and includes maintenance of the boat and safety equipment as well as mooring and berthing apparatus.

This unit is one of three core competencies that have been adopted by all government marine safety authorities to contribute to and promote the safe use of waterways and awareness of boating safety and applies specifically to mechanical powered recreational boats, including personal watercraft. However, it is recognised that some aspects of this competency apply to any recreational vessel.

Where general operational checks and basic assessment of the condition of a vessel are required units MEM50006 Check operational capability of marine craft and MEM50007 Check operational capability of sails and sail operating equipment should be selected as appropriate.

Unit MEM50009 Safely operate a mechanically powered recreational boat and unit MEM50010 Respond to boating emergencies and incidents are the other two NMSC core units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

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Competency Field

Boating services

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Maintain the boat and safety equipment**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Ensure boat is maintained/serviced on a regular basis
		1.4	Ensure safety equipment complies with relevant legislation
		1.5	Identify location of safety equipment ensuring it is serviceable and accessible, and stowed securely and appropriately
2	**Maintain mooring and berthing apparatus**	2.1	Maintain/service mooring and berthing apparatus on a regular basis
		2.2	Ensure mooring apparatus is appropriate to the vessel and location
3	**Plan trip**	3.1	Check weather conditions, vessel and personnel for suitability for planned trip
		3.2	Ensure trip activity plan takes into account area and type of operation and emergency contact
		3.3	Carry out adequate provisions, including fuel, for trip
		3.4	Communicate trip details to appropriate person
		3.5	Check to ensure the number of passengers does not exceed boat design limitations and/or legislative requirements
		3.6	Check to ensure equipment, stores and personal items are securely stowed and do not adversely affects the boat's stability

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.7 Conduct pre-start checks on equipment operation
	3.8 Inform appropriate person of safe return from the activity

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Safety equipment includes the following:

- life jackets
- bailers
- dinghy/life raft
- paddles/oars
- bilge pumps
- bucket and line
- first aid kit
- fire extinguisher
- distress signalling equipment
- marine radio
- waterproof torch
- charts
- anchor/sea anchor
- lifebuoy
- compass
- sound signal
- drinking water
- towing harness
- isolating switches
- tow rope
- local emergency procedures book
- sounding equipment
- emergency position-indicating radio beacon (EPIRB)
- global positioning system (GPS)
- divers flag
- suitable clothing
- alternative means of propulsion

Maintaining/servicing mooring and berthing apparatus includes the following:

- appropriateness of mooring/berthing
- regularity of checks
- services by recognised contractor
- serviceable mooring and berthing lines, fenders, anchors and ground tackle

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Weather conditions include the following:

- current forecast
- wind
- latest weather and conditions information
- source of weather information
- tides (flood and ebb tides)
- rips and bars
- wave height
- visibility
- day/night

Area and type of operation includes the following:

- hazards
- local knowledge
- rules and protocols
- events
- emergency response
- access and exit points
- safe havens
- launching ramps
- destination port

Adequate provisions include the following:

- suitability of the vessel for the activity
- adequate fuel for the distance
- water, food and ice
- sun protection
- wet weather gear
- first aid kit
- personal medications
- batteries
- gas
- emergency (reserve) fuel and method of fuel transfer

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Trip details include the following:

- trip departure and return time
- number of people in the boat
- area and nature of operation
- way points
- radio used and frequency
- call signs
- details of vessel, including description and registration number
- shore contact details
- fuel capacity and usage
- trailer registration number

Appropriate person includes one (1) or more of the following:

- family member or relative
- neighbour(s)
- police - water or local
- marine rescue services
- club or organisation
- harbour master
- costal radio station
- leave a note in your vehicle parked at the departure location (if appropriate)

Pre-start checks include the following:

- fuel is connected
- battery is charged and connected
- kill switch
- fumes and petrol
- fuel and water leaks
- hatches/windows/doors are open
- ventilation
- sea-cock opening
- loose gear is secured
- marine radio is turned on and radio aerials raised
- bilge water levels checked
- navigation lights

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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50008B Carry out trip preparation and planning

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50008 Carry out trip preparation and planning

Modification History

Release 1. Supersedes and is equivalent to MEM50008B Carry out trip preparation and planning

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- checking to ensure boat is maintained and all safety equipment complies with relevant legislation
- maintaining mooring and berthing apparatus on a regular basis and is appropriate to the vessel and location
- planning the trip, including interpreting weather forecasts for suitability
- ensuring safe passenger numbers, safe stowing of all equipment/items and serviceability of safety equipment
- carrying adequate provisions, including fuel and communicating trip details with appropriate personnel and informing person on safe return from activity.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- weather information
- vessel maintenance and service schedule requirements
- capabilities of boat
- safety equipment required on-board boat
- safety procedures
- marine legislation, regulations and rules
- area of activity
- legislative requirements regarding the use of safety equipment.

Assessment Conditions

- Assessors must:

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  - have vocational competency in carrying out trip preparation and planning at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50009 Safely operate a mechanically powered recreational boat

Modification History

Release 1. Supersedes and is equivalent to MEM50009B Safely operate a mechanical powered recreational boat

Application

This unit of competency was developed by the National Marine Safety Committee (NMSC) and defines the skills and knowledge required to safely handle/operate a powered recreational boat on coastal and inland waters and includes manoeuvring and handling the boat as well as safe navigation and anchoring.

This unit is one of three core competencies that have been adopted by all government marine safety authorities to contribute to and promote the safe use of waterways and awareness of boating safety and applies specifically to mechanical powered recreational boats, including personal watercraft. However, it is recognised that some aspects of this competency apply to any recreational vessel.

Unit MEM50008 Carry out trip preparation and planning and unit MEM50010 Respond to boating emergencies and incidents are the other two NMSC core units.

Some jurisdictions may require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: **A**

Unit Weight: **2**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Boating services

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Manoeuvre and handle the boat**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Undertake a pre-start checks and start motor
		1.4	Manoeuvre boat safely according to conditions and in accordance with water traffic regulations
		1.5	Monitor performance of the boat and personnel at all times
		1.6	Consider impact of boat use on others and the environment
		1.7	Use safety equipment, stow and, as required, wear in accordance with legislation and recognised regulations and rules
2	**Navigate safely**	2.1	Identify aids to small craft navigation
		2.2	Apply collision avoidance techniques when required in accordance with relevant legislation, recognised regulations and rules
		2.3	Carry out operation of the boat at all times in accordance with relevant legislation, recognised regulations and rules
		2.4	Use navigational aids and landmarks to determine and monitor boat position
		2.5	Take into account hazards and conditions in navigating the boat
3	**Anchor the boat**	3.1	Select anchorage site in accordance with prevailing and forecast conditions and in accordance with legislation
		3.2	Use type of anchor and anchoring system suitable for location
		3.3	Lower, set and monitor anchor according to prevailing conditions

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	3.4 Retrieve and securely stow anchor

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Pre-start checks include the following:	• fuel is connected • battery is charged and connected • kill switch • fumes and petrol • fuel and water leaks • hatches/windows/doors are open • ventilation • sea-cock opening • loose gear is secured • marine radio is turned on and radio aerials raised • bilge water levels checked • navigation lights
Manoeuvring conditions include the following:	• from or to a ramp, pontoon, wharf, mooring, anchor, confined areas, such as narrow channels, marinas, moorings and obstructions • sea-states, including bars, waves, rips, high seas, tidal surges, choppy conditions and wakes • low speed/high speed • poor visibility • effect of wind

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

- large vessels

Safe manoeuvring includes the following:

- steer straight line
- astern
- figure-eight
- right of way
- port-starboard
- throttle control
- emergency stop
- trim and stability of vessel
- towing or being towed
- berthing
- standing-on/stemming the tide
- retrieval of person overboard

Monitoring includes the following:

- cooling system
- bilge
- portholes and hatches
- location and welfare of persons on board
- oil, fuel and water
- radio
- position of boat
- other water users
- battery and electrical systems

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Others and environment include the following:	• noise • wake • safety of others • disturbance or injury to wildlife • disposal of waste and bilge water • effects of detergent and anti-foul • fuelling arrangements
Aids to small craft navigation include one (1) or more of the following:	• IALA Buoyage System ‘A’ • charts • compasses • global positioning system (GPS) • sounder • tide tables • passage plan • marine references • notices to mariners • radio navigational warnings

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Relevant legislation, recognised regulations and rules include the following:

- collision regulations:
  - navigating in narrow channels
  - giving way to other vessels
  - overtaking, proper lookout
  - sound signals
  - lights and shapes
  - responsibilities and duty of care
  - use of buoyage system
  - speed
  - recognition of lights and markers
  - rules of road
  - recognition of operation areas
  - specific activity rules, e.g. personal watercraft (PWCs), water skis and equipment requirements
  - accident/incident reporting
- marine regulations:
  - safety regulations
  - licensing and registration
  - speed limit restrictions
  - distance off requirements
  - port limits/rules
  - marine incident reporting
  - carrying capacity
  - drug and alcohol limits/effects
  - age of operators
- environmental and wildlife regulations as relevant and applicable to the operation of boats

Hazards and conditions include the following:

- weather
- set and drift
- effect of wind, tide and currents
- submerged objects
- other boats and wash
- restricted waters
- crossing bars

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Types of anchor include one (1) or more of the following:	• Danforth • Grapnel/Reef • Bruce • Plough • Admiralty • Sarca • sea anchor
Anchoring systems include one (1) or more of the following:	• multiple anchors • bow and stern anchors • mooring buoy

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50009B Safely operate a mechanical powered recreational boat

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50009 Safely operate a mechanically powered recreational boat

Modification History

Release 1. Supersedes and is equivalent to MEM50009B Safely operate a mechanical powered recreational boat

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- conducting pre-start checks
- manoeuvring and handling boat safely and accurately according to conditions and in accordance with water traffic regulations
- monitoring performance of boat and be aware of impact of boat use on others and the environment
- navigating safely, taking hazards into account using navigational aids and landmarks to determine and monitor boat position
- anchoring the boat using the type of anchor and anchoring system suitable for location.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- pre-start checks
- boating and other relevant legislation, rules and regulations
- legislative requirements regarding the use of safety equipment
- area of activity hazards and prevailing conditions
- boating information resources
- environmental awareness.

Assessment Conditions

- Assessors must:
  - have vocational competency in safely operating a mechanical powered recreational boat at least to the level being assessed with relevant industry knowledge and experience

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  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MEM50010 Respond to boating emergencies and incidents

Modification History

Release 1. Supersedes and is equivalent to MEM50010B Respond to boating emergencies and incidents

Application

This unit of competency was developed by the National Marine Safety Committee (NMSC) and defines the skills and knowledge required to deal with boating emergencies and incidents, including the use of safety equipment and the provision of assistance to others in distress and includes raising alarms and dealing with on-board emergencies.

This unit is one of three core competencies that have been adopted by all government marine safety authorities to contribute to and promote the safe use of waterways and awareness of boating safety and applies to all recreational boats including personal watercraft.

Unit MEM50008 Carry out trip preparation and planning and unit MEM50009 Safely operate a mechanically powered recreational boat are the other two NMSC core units.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: **E**

Unit Weight: **0**

Pre-requisite Unit

MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information

Competency Field

Boating services

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Use safety equipment**	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Ensure nature, type, location, accessibility and serviceability of safety equipment is known and understood by all personnel on board
		1.4	Conduct briefing of personnel before departure
		1.5	Use safety equipment in a manner and purpose for which it was designed and appropriate to the emergency or incident
2	**Raise alarms**	2.1	Identify nature of emergency
		2.2	Communicate alarm to on-board personnel
		2.3	Use recognised distress signals to indicate need of assistance
3	**Deal with on-board emergency**	3.1	Inform on-board personnel of actions required to deal with the emergency
		3.2	Implement procedures to combat emergency and protect persons on board
		3.3	Identify position, record and communicate
		3.4	Provide injured persons with assistance
		3.5	Maintain communication with rescuers
		3.6	Undertake preparation for abandoning the boat, as required
		3.7	Communicate cessation of emergency to appropriate personnel
4	**Assist others in distress**	4.1	Recognise distress signals from others
		4.2	Identify nature of assistance required
		4.3	Determine capability to safely assist or relay emergency taking into account own safety and physical proximity to

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	the emergency incident
	4.4 Prepare for appropriate response to the emergency and implement
	4.5 Communicate cessation of emergency incident to appropriate personnel

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Briefing information includes the following:

- vessel operation
- personnel assessment, including swimming skills, boating knowledge, medication and dietary requirements
- location and use of safety equipment
- emergency procedures
- abandoning procedures

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Emergencies include one (1) or more of the following:

- fire (smoke or heat)
- grounding
- person overboard
- person retrieval from water
- capsize
- swamping
- sinking
- engine/motor breakdown or malfunction
- fouled propeller
- anchoring
- flooding
- lost
- injuries/illness
- hypothermia
- lack of fuel
- contaminated fuel

Distress signals include one (1) or more of the following:

- pyrotechnic distress flares
- flags
- radio
- hand signals
- dye markers
- International Code Signal of Distress
- sound signal including voice
- emergency position-indicating radio beacon (EPIRB)
- V-sheet
- reflective mirror
- light signals
- mobile phone

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This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Preparation for abandoning includes the following:	• brief on-board personnel • take drinking water • don of life jackets • identify location of vessel • communicate to rescuers actions taken or to be taken • assess and ensure readiness of life rafts/life rings • activate emergency position indicating radio beacon (EPIRB) • identify and collect emergency equipment, provisions and clothing • deploy anchor or sea anchor

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM50010B Respond to boating emergencies and incidents

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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Assessment Requirements for MEM50010 Respond to boating emergencies and incidents

Modification History

Release 1. Supersedes and is equivalent to MEM50010B Respond to boating emergencies and incidents

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- using safety equipment in a correct manner appropriate to the emergency or the incident
- communicating while under pressure
- briefing others on safety and emergency procedures
- demonstrating boat abandoning procedures
- delegating personnel appropriate to the emergency situation, including raising the alarm and assisting others in distress
- determining capability to assist others and making decision under pressure
- assisting injured people safely and without undue risk
- applying emergency first aid, where appropriate
- communicating cessation of emergency incident to appropriate personnel in accordance with procedures.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures
- range of safety equipment
- common emergency actions
- emergency procedures
- boat abandoning procedures
- relevant contacts
- communication protocols
- types of boating emergency incidents and situations
- protocols for assisting injured people
- boating legislation, regulations and rules

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Assessment Conditions

- Assessors must:
  - have vocational competency in responding to boating emergencies and incidents at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011,* its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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MSATCM304A Interpret basic binary phase diagrams

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	This unit covers the knowledge and skills needed to interpret phase diagrams and so predict the microstructures of binary alloys.

Application of the Unit

Application of the unit	This unit applies to the interpretation of cooling phase diagrams as used in metallurgy. The application will primarily be to phase diagrams of metals and alloys showing temperature and composition variables. In a typical scenario, a metallurgical technician will be required to recommend a phase transition process in order to obtain a required microstructure, or to predict a microstructure from a known phase transition process.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Pre-requisite Units		

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Employability Skills Information

Employability Skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the microstructures from an equilibrium cooling phase diagram	1.1. Phase diagram for metal or alloy is obtained from internal or external sources 1.2. Identify number, composition, proportion and structural arrangement of phases in binary alloys. 1.3. Describe structural changes due to varying proportion of alloying elements and temperature. 1.4. Describe the phase changes and final microstructures of binary alloys cooled under equilibrium conditions from the melt or during heat treatment operations.
2. Identify the microstructures from a non equilibrium cooling phase diagram	2.1. Identify number, composition, proportion and structural arrangement of phases in binary alloys. 2.2. Describe structural changes due to varying proportion of alloying elements and temperature. 2.3. Describe the phase changes and final microstructures of binary alloys cooled under equilibrium conditions from the melt or during heat treatment operations.
3. Recognise characteristic microstructures of binary alloys	3.1. .Recognise characteristic structures of dendrites (homogeneous and cored) columnar and equiaxed grains. 3.2. Recognise characteristic structures resulting from eutectic, eutectoid and peritectic reactions. 3.3. Recognise characteristic structures resulting from solid state precipitation.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level, required for this unit.
Required skills:
• produce a basic cooling phase diagram from supplied data • estimate composition from the structure of a phase diagram • predict structure from the composition from a phase diagram
Required knowledge:
Competency includes sufficient knowledge of: • methods of construction of phase diagrams for binary alloys. • the phase changes that occur in binary alloy systems as recorded by the appropriate phase diagrams. • the equilibrium and non equilibrium cooling of binary alloys and the resulting microstructures in cast and heat treated material.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	The person will be able to interpret binary phase diagrams. Assessment may be by workplace project, case study or suitable alternative.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the ability to: • recognise and use correct scientific terminology in regards to phase diagrams • source phase diagrams and other reference material from internal or external sources • use phase diagrams to interpret intermediate and final phase structures of binary alloys
Relationship to other units	This unit may be assessed concurrently with other relevant units.

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EVIDENCE GUIDE	
Assessment method and context	Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the elements, performance criteria, skills and knowledge. A holistic approach should be taken to the assessment. Assessors should gather sufficient, fair, valid, reliable, authentic and current evidence from a range of sources. Sources of evidence may include direct observation, reports from supervisors, peers and colleagues, project work, samples, organisation records and questioning. Assessment should not require language, literacy or numeracy skills beyond those required for the unit. The assessee will have access to all techniques, procedures, information, resources and aids which would normally be available in the workplace. The method of assessment should be discussed and agreed with the assessee prior to the commencement of assessment.
Resource implications	This section should be read in conjunction with the range of variables for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Codes of practice/standards	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
Scientific techniques and principles of cooling phase diagrams relate to	• Equilibrium phase diagrams • Non-equilibrium phase diagrams • Effect of temperature and alloying elements on structural changes • Structures of homogenous and cored dendrites • Structures of columnar and equiaxed grains • Eutectic, eutectoid and peritectic reactions

Unit Sector(s)

Unit Sector	Metallurgy

Competency field

Competency Field	

Co-requisite units

Co-requisite Units		

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MSMENV272 Participate in environmentally sustainable work practices

Modification History

Release 2. Equivalent. Minor edits for improved clarity. Range of conditions removed. Duplication between Performance Evidence and Performance Criteria removed. Assessment conditions updated.

Release 1. Supersedes and is equivalent to MSAENV272B Participate in environmentally sustainable work practices.

Application

This unit describes the skills and knowledge required to comply with environmental regulations, identify environment issues and minimise the risks of negative impact on work and carry out improvements in own work area.

This unit applies to operators and team members who are required to follow procedures to work in an environmentally sustainable manner.

This unit applies to all sectors of the manufacturing industry and members of its value chain. It may also be applied to all sections of an organisation, including office and warehouse. This unit will need to be contextualised for the industry sector, organisation and section.

This unit applies to an individual working alone or as part of a team and working in liaison with other shift team members and the control room operator, as appropriate.

No licensing or certification requirements exist at the time of publication. Relevant legislation, industry standards and codes of practice within Australia must also be applied.

Pre-requisite Unit

Nil

Unit Sector

HSE

Elements and Performance Criteria

Elements	**Performance Criteria**
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*

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Elements	Performance Criteria
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
1. Identify current resource use and environmental issues	1.1 Identify workplace environmental and resource efficiency issues 1.2 Identify resources used in own work role 1.3 Confirm current usage of resources
2. Comply with environmental regulations	2.1 Read and follow environmental policies and procedures to ensure compliance with federal, state/territory and local government laws, by-laws, regulations and mandated codes of practice, and codes and standards that the organisation applies voluntarily 2.2 Ask questions and seek clarification relating to environmental work requirements 2.3 Identify incidents, including breaches or potential breaches of environmental regulations and occurrences outside of standard procedures and report to appropriate personnel 2.4 Report environmental incidents using workplace forms and procedures
3. Seek opportunities to improve environmental practices and resource efficiency	3.1 Follow workplace procedures to improve environmental practices and resource efficiency 3.2 Make suggestions for improvements to environmental workplace practices and work plans

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Release 2. Supersedes and is equivalent to MSAENV272B Participate in environmentally sustainable work practices.

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=d1287d36-dff4-4e9f-ad2c-9d6270054027

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Assessment Requirements for MSMENV272 Participate in environmentally sustainable work practices

Modification History

Release 2. Equivalent. Minor edits for improved clarity. Range of conditions removed. Duplication between Performance Evidence and Performance Criteria removed. Assessment conditions updated.

Release 1. Supersedes and is equivalent to MSAENV272B Participate in environmentally sustainable work practices.

Performance Evidence

There must be evidence the candidate has completed the tasks outlined in the elements and performance criteria of this unit, and:

- followed environmental policies and identified potential breaches of environmental regulations and suggested improvements within the limit of own authority.
-

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- environmental sustainability issues relevant to organisation
- resource use and impact of inefficiencies associated with own work role
- environmental and resource efficiency policies and procedures for own work role
- environmental regulations and guidelines and their impact on own work role
- the environmental issues, hazards and risks associated with own work role
-

Assessment Conditions

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions and contingencies. The following conditions must be met for this unit:

- use of suitable facilities, equipment and resources, including:
  - environmental regulations, guidelines and procedures
  - workplace incident reporting procedures and forms.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

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Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=d1287d36-dff4-4e9f-ad2c-9d6270054027

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MSMENV472 Implement and monitor environmentally sustainable work practices

Modification History

Release 1. Supersedes and is equivalent to MSAENV472B Implement and monitor environmentally sustainable work practices

Application

This unit of competency covers the skills and knowledge required to effectively analyse the workplace in relation to environmentally sustainable work practices, and to implement improvements and monitor their effectiveness.

This unit of competency applies to those who have responsibility for a specific area of work or who lead a work group or team. It addresses the knowledge, processes and techniques necessary to implement and monitor environmentally sustainable work practices, including the development of processes and tools.

It includes identifying areas for improvement, developing plans to make improvements, and implementing and monitoring improvements in environmental performance.

This unit of competency applies to all sectors of the manufacturing industry and members of its value chain. It may also be applied to all sections of an organisation, including office and warehouse. This unit will need to be appropriately contextualised as it is applied across an organisation and across different industry sectors.

This unit of competency applies to an individual working alone or as part of a team/work group and working in liaison with other shift team members and the control room operator, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

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Competency Field

HSE

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes		Performance criteria describe the performance needed to demonstrate achievement of the element	
1	**Investigate current practices in relation to resource usage**	1.1	Identify environmental regulations applying to the enterprise
		1.2	Assess procedures for assessing compliance with environmental regulations
		1.3	Collect information on environmental and resource efficiency systems and procedures and provide to the work group, as required
		1.4	Measure and record current resource usage by members of the work group
		1.5	Analyse and record current purchasing strategies
		1.6	Analyse current work processes to access information and data, and assist in identifying areas for improvement
2	**Set targets for improvements**	2.1	Seek input from stakeholders, key personnel and specialists
		2.2	Access external sources of information and data as required
		2.3	Evaluate alternative solutions to workplace environmental issues
		2.4	Set efficiency targets
3	**Implement performance**	3.1	Source and use techniques/tools to assist in achieving targets

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	improvement strategies	3.2	Apply continuous improvement strategies to own work area of responsibility, and communicate ideas and possible solutions to the work group and management
		3.3	Integrate environmental and resource efficiency improvement plans for own work group with other operational activities and implement them
		3.4	Seek suggestions and ideas about environmental and resource efficiency management from stakeholders and act upon them where appropriate
		3.5	Implement costing strategies to fully value environmental assets
4	**Monitor performance**	4.1	Document outcomes and communicate reports on targets to key personnel and stakeholders
		4.2	Evaluate strategies and environmental performance, including breaches or potential breaches of regulations and occurrences outside of standard procedure which may lead to lower environmental performance
		4.3	Set new targets and investigate and apply new tools and strategies
		4.4	Promote successful strategies and reward participants where possible

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements
- *ISO 14001:2015 Environmental management systems*

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or more of the following:

- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant

Unit Mapping Information

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=d1287d36-dff4-4e9f-ad2c-9d6270054027

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Assessment Requirements for MSMENV472 Implement and monitor environmentally sustainable work practices

Modification History

Release 1. Supersedes and is equivalent to MSAENV472B Implement and monitor environmentally sustainable work practices

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and must include the ability to:

- investigate/analyse resource usage
- evaluate improvement alternatives and set targets
- implement improvements within the limit of own authority
- monitor the performance of improvements.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- relevant environmental and resource efficiency issues, specific to industry practices, including:
  - contribution to climate change and other macro threats that can arise from materials and work processes used
  - regulated environmental issues
  - issues relevant to licencing conditions
- best practice environmental approaches relevant to own area of responsibility
- methods for measuring and calculating resource usage.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
  - should occur over a range of situations
  - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
  - will typically include the use of appropriate tools, equipment and documents

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    - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible, or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment reflecting realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
    - walk-throughs
    - pilot plant operation
    - demonstration of skills
    - industry based case studies/scenarios
    - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- As a minimum, assessors must satisfy the Standards for Registered Training Organisations 2015 assessor requirements.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=d1287d36-dff4-4e9f-ad2c-9d6270054027

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PMBPROD291 Operate resin infusion moulding equipment

Modification History

Release 1. Supersedes and is equivalent to PMBPROD291B Operate resin infusion moulding equipment

Application

This unit of competency covers the skills and knowledge required to operate resin infusion moulding equipment to make composite parts.

This unit of competency applies to operators who are required to take product off mould table; prepare materials and moulds; check vacuum bags, infusion lines, closures and fittings; operate the equipment; and recognise routine and non-routine problems and take appropriate action.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Production

Unit Sector

Not applicable

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.

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1	**Check work requirements**	1.1	Identify work requirements from procedures
		1.2	Check product, materials and equipment meet requirements for job
		1.3	Recognise requirements which may not be in accordance with usual practice
		1.4	Ask questions of appropriate person to confirm non-standard job specifications
		1.5	Ensure housekeeping is to requirements
		1.6	Identify hazards associated with the job and take appropriate action
		1.7	Perform other pre-operational checks in accordance with procedures
2	**Conduct pre-operational checks as required**	2.1	Check safety equipment is in position and working
		2.2	Check moulds, closures and fittings to procedures
		2.3	Check moulds for cracks, chips, marks and cleanliness
		2.4	Check materials, including fibre preforms, resins, additives and release agents are correct
		2.5	Undertake other pre-operational checks in accordance with procedures
3	**Operate resin infusion equipment, to procedure**	3.1	Check process is operating within required limits
		3.2	Check product is in specification and to required quality standard
		3.3	Ensure product is consistently ready for next operation
		3.4	Maintain supply of materials as required
		3.5	Complete logs and records as required
		3.6	Collect and segregate scrap, waste and other materials as required
		3.7	Keep equipment and work area clean
		3.8	Pause infusion cycle and perform emergency stop as

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			required
4	**Resolve routine problems, to procedure**	4.1	Recognise known faults that occur during the operation
		4.2	Identify and take action on causes of routine faults
		4.3	Log problems as required
		4.4	Identify non-routine process and quality problems and take appropriate action

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, equipment and production processes and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the

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legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- moulds
- vacuum bags
- infusion lines
- vacuum pumps and fittings eg hoses and couplings
- programmable logic controllers (PLC) if fitted
- hand tools used in the this process, e.g. dispensing equipment.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids, such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- electricity
- gas

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- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment and product mass
- other hazards that might arise.

Routine problems

Routine problems must be resolved by applying known solutions.

Routine problems are predictable and include one or more of:

- equipment malfunction
- vacuum leaks
- vacuum bag bridging
- vacuum switch-off timing
- stoppage of resin flow
- variations in process conditions especially temperature
- variations affecting cure rate
- variations in materials
- contamination of materials
- equipment, tool or mould damage
- dry spots
- resin pooling
- under-saturation of resin
- poor surface finish
- routine product faults.

Known solutions are drawn from one or more of:

- procedures
- training
- remembered experience.

Non-routine problems must be reported according to according to relevant procedures.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD291B Operate resin infusion moulding equipment

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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD291 Operate resin infusion moulding equipment

Modification History

Release 1. Supersedes and is equivalent to PMBPROD291B Operate resin infusion moulding equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, material labels and safety data sheets (SDS)
- select and use materials, tools and equipment to meet job specifications
- prepare moulds, fibre preforms, resins, additives and release agents to specifications
- monitor resin infusion moulding equipment and ancillary equipment using measured/indicated data and smell, sight, sound and feel as appropriate
    - monitor and interpret key variables, including:
    - vacuum bag conditions
    - resin flow
    - curing time and conditions
    - production rate
    - product integrity and general conformance to specification
- operate and adjust the equipment to meet product quality and production output specifications
- pause the equipment or shut down equipment in normal and abnormal circumstances
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- recognise routine and non-routine problems
- identify when the operator is able to rectify faults, when assistance is required and who is the appropriate source for assistance
- take action to resolve faults or report faults to appropriate personnel
- distinguish between possible causes of routine faults. including:
    - raw material variations/contamination
    - process abnormalities
    - procedural errors

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    - mechanical abnormalities
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate under routine only supervision and to solve routine problems, including knowledge of:

- function of infusion moulding equipment
- principles of operation of the equipment
- role of fibres, resins, additives and release agents
- the potential effects of variations in raw materials and equipment operation in relation to quality of product
- production workflow sequences and materials demand
- process behaviours of resins and the role of additives
- factors which may affect product quality or production output and appropriate remedies
- routine problems, their probable causes and relevant corrective actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
    - their possible causes
    - potential consequences
    - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
    - teamwork
    - communication.
- The collection of performance evidence:
    - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant
    - will typically include a supervisor/third-party report or other evidence, focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
    - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems

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  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including, relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures

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- having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
- conducting on the job training/assessments of the type of work being assessed
- being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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PMBPROD294 Operate resin transfer moulding equipment

Modification History

Release 1. Supersedes and is equivalent to PMBPROD294B Operate resin transfer moulding equipment

Application

This unit of competency covers the skills and knowledge required to operate resin transfer moulding equipment to make composite parts.

This unit of competency applies to operators who are required to prepare materials and moulds, operate the equipment, maintain supply of materials, and recognise routine and non-routine problems and take appropriate action.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Production

Unit Sector

Not applicable

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Conduct**	1.1	Check safety equipment is in position and working

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	pre-operational checks as required	1.2	Check moulds, closures and fittings to procedures
		1.3	Check moulds for cracks, chips, marks and cleanliness
		1.4	Check materials including fibre preforms, resins, additives and release agents are correct
		1.5	Undertake other pre-start checks in accordance with procedures.
2	**Operate equipment to procedures**	2.1	Check process is operating within required limits
		2.2	Check product is in specification and to required quality standard
		2.3	Maintain supply of materials as required
		2.4	Complete logs and records as required
		2.5	Collect and segregate scrap, waste and other materials as required
		2.6	Complete logs and records as required
		2.7	Keep equipment and work area clean
		2.8	Pause cycle or stop equipment in an emergency, as required
3	**Resolve routine problems**	3.1	Recognise known faults that occur during the operation
		3.2	Identify and take action on causes of routine faults
		3.3	Log problems as required
		3.4	Identify non-routine problems and report to designated person

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, equipment and production processes and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- resin transfer moulding equipment

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- moulds
- resin pumps and fittings
- programmable logic controllers (PLC) if fitted
- ancillary equipment that is integral to the process.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids, such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- high temperatures
- electricity
- gas
- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment and product mass
- other hazards that might arise.

Routine problems

Routine problems must be resolved by applying known solutions.

Routine problems are predictable and include one or more of:

- incorrect supply of resin to mould
- equipment malfunction
- variations in process conditions, especially temperature
- variations affecting cure rate
- variations in materials or contamination of materials
- equipment, tool or mould damage
- routine product faults
- mould/tooling problems.

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Known solutions are drawn from one or more of:

- procedures
- training
- remembered experience.

Non-routine problems must be reported according to according to relevant procedures.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD294B Operate resin transfer moulding equipment

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD294 Operate resin transfer moulding equipment

Modification History

Release 1. Supersedes and is equivalent to PMBPROD294B Operate resin transfer moulding equipment

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, basic machine control panels, material labels and safety data sheets (SDS)
- select and use materials, tools and equipment to meet job specifications
- prepare moulds, fibre preforms, resins, additives and release agents to specifications
- monitor resin transfer moulding equipment and ancillary equipment using measured/indicated data and smell, sight, sound and feel as appropriate
- monitor and interpret key variables, including:
  - operating temperatures
  - cycle time
  - output rate
  - surface finish and condition
  - product weight
  - product integrity and general conformance to specification
- operate and adjust the equipment to meet product quality and production output specifications
- pause the equipment or shut down equipment in normal and abnormal circumstances
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- recognise routine and non-routine problems
- identify when the operator is able to rectify faults, when assistance is required and who is the appropriate source for assistance
- take action to resolve faults or report faults to appropriate personnel
- distinguish between possible causes of routine faults, including:
  - raw material variations/contamination
  - process abnormalities

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  - procedural errors
  - mechanical abnormalities
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate under routine only supervision and to solve routine problems, including knowledge of:

- function of resin transfer moulding equipment
- principles of operation of the equipment
- role of fibres, resins, additives and release agents
- the potential effects of variations in raw materials and equipment operation in relation to quality of product
- production workflow sequences and materials demand
- process behaviours of resins and the role of additives
- factors which may affect product quality or production output and appropriate remedies
- routine problems, their probable causes and relevant corrective actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
  - their possible causes
  - potential consequences
  - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
  - teamwork
  - communication.
- The collection of performance evidence:
  - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant
  - will typically include a supervisor/third-party report or other evidence, focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency

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  - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems
  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures

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- having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
- conducting on the job training/assessments of the type of work being assessed
- being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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PMBPROD298 Operate equipment using pre-preg material

Modification History

Release 1. Supersedes and is equivalent to PMBPROD298B Operate equipment using pre-preg material

Application

This unit of competency covers the skills and knowledge required to operate equipment using pre-preg materials to produce composite parts.

This unit of competency applies to operators who are required to prepare pre-preg and other materials, prepare moulds, monitor and operate the equipment, and recognise routine and non-routine problems and take appropriate action.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Production

Unit Sector

Not applicable

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Check work**	1.1	Identify work requirements from procedures

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	requirements	1.2	Identify product, materials and equipment requirements for job
		1.3	Recognise hazards and adopt steps required to ensure safety
		1.4	Check with supervisor/appropriate person if requirements are not in accordance with usual practice
2	**Conduct pre-start checks as required**	2.1	Check safety gates and guards are in position and working
		2.2	Check moulds, closures and fittings to procedures
		2.3	Check moulds for cracks, chips, marks and cleanliness
		2.4	Check pre-preg materials and other raw materials are correct
		2.5	Undertake other pre-start checks in accordance with procedures
3	**Operate equipment**	3.1	Start equipment safely and correctly when required
		3.2	Check process is within required limits
		3.3	Collect products and store as required
		3.4	Check product/process is in specification/to required quality standard
		3.5	Maintain supply of materials as required
		3.6	Complete logs and records when required
		3.7	Collect and reprocess/discard scrap/trim, waste and other materials in accordance with procedures
		3.8	Clean up equipment and work area in accordance with procedures
		3.9	Pause or stop equipment in an emergency, following workplace and emergency procedures
4	**Respond to routine problems**	4.1	Recognise known faults that occur during the operation
		4.2	Identify and take action on causes of routine faults

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to procedures	4.3	Log problems as required
	4.4	Identify non-routine process and quality problems and take appropriate action

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, equipment and production processes and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form,

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and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- moulds
- moulding equipment and closures
- programmable logic controllers (PLC) if fitted
- ancillary equipment that is integral to the process
- hand tools used in the this process.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids, such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- high temperatures
- electricity
- gas
- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment and product mass
- other hazards that might arise.

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Routine problems

Routine problems must be resolved by applying known solutions.

Routine problems are predictable and include one or more of:

- equipment malfunction
- poor handling or storage of pre-preg materials
- pre-preg incorrectly applied to mould
- variations in process conditions, especially temperature
- variations affecting cure rate
- variations in materials and/or contamination of materials
- equipment, tool or mould damage
- incorrect quantity of materials
- contaminated materials/additives
- equipment damage/faults
- mould damage
- wrong raw materials/additives
- incorrect quantity of materials/additives
- routine product faults
- machine failure
- mould/tooling problems.

Known solutions are drawn from one or more of:

- procedures
- training
- remembered experience.

Non-routine problems must be reported according to according to relevant procedures.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD298B Operate equipment using pre-preg material

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD298 Operate equipment using pre-preg material

Modification History

Release 1. Supersedes and is equivalent to PMBPROD298B Operate equipment using pre-preg material

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, basic machine control panels, material labels and safety data sheets (SDS)
- select and use materials, tools and equipment to meet job specifications
- prepare pre-pregs, moulds, fibre preforms, resins, additives and release agents to specifications
- monitor the equipment using measured/indicated data and smell, sight, sound and feel as appropriate
- monitor and interpret key variables, including:
  - operating temperatures
  - process conditions/variables
  - cycle time
  - output rate
  - product integrity and general conformance to specification
- operate and adjust the equipment to meet product quality and production output specifications
- pause the equipment or shut down equipment in normal and abnormal circumstances
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- recognise routine and non-routine problems
- identify when the operator is able to rectify faults, when assistance is required and who is the appropriate source for assistance
- take action to resolve faults or report faults to appropriate personnel
- distinguish between possible causes of routine faults, including:
  - raw material variations/contamination
  - process abnormalities
  - procedural errors

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    - mechanical abnormalities
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate under routine only supervision and to solve routine problems, including knowledge of:

- function of the equipment
- principles of operation of the equipment
- types and application of common pre-pregs
- role of fibres, resins, additives and release agents
- the potential effects of variations in raw materials and equipment operation in relation to quality of product
- production workflow sequences and materials demand
- process behaviours of polymers and the role of additives
- factors which may affect product quality or production output and appropriate remedies
- routine problems, their probable causes and relevant corrective actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
    - their possible causes
    - potential consequences
    - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
    - teamwork
    - communication.
- The collection of performance evidence:
    - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant
    - will typically include a supervisor/third-party report or other evidence, focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency

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  - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems
  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures

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- having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
- conducting on the job training/assessments of the type of work being assessed
- being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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PMBPROD391 Produce composites using resin infusion

Modification History

Release 1. Supersedes and is equivalent to PMBPROD391B Produce composites using resin infusion

Application

This unit of competency covers the skills and knowledge required to operate and adjust resin infusion processes to produce product.

This competency applies to experienced operators who are required to start up and shut down resin infusion equipment, monitor equipment operation, establish a stable process, make adjustments to remedy faults and non-conformity and solve problems within area of responsibility.

This unit of competency applies to an experienced operator demonstrating theoretical and technical knowledge and well developed skills in situations that require some discretion and judgement. The operator may work alone or as a member of a team or group and will work in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

PMBPROD291 Operate resin infusion moulding equipment

Competency Field

Production

Unit Sector

Not applicable

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Plan own work requirements**	1.1	Identify the most appropriate equipment to be used for production and upstream and downstream operations from production plan or request
		1.2	Identify and check materials required, including additives
		1.3	Implement measures to control hazards in line with procedures and duty of care
		1.4	Identify requirements for materials, quality, production and equipment checks
2	**Start resin infusion moulding process to procedures**	2.1	Identify process settings for required product
		2.2	Set process to required settings
		2.3	Check materials are correct
		2.4	Take appropriate action for non-conforming materials
		2.5	Set up date, batch and materials markings to specifications, as required
		2.6	Complete pre-start checks
		2.7	Start up resin infusion moulding process
3	**Operate and make adjustments to the resin infusion process to procedures**	3.1	Operate resin infusion equipment, noting key variables
		3.2	Monitor controls/displays/terminals for production and process data
		3.3	Take samples as required and identify product out of specification
		3.4	Monitor product/process quality
		3.5	Make adjustments to remedy faults and non-conformity to standard as required
		3.6	Establish a stable resin infusion process

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		3.7	Adjust process to minimise scrap and trim
		3.8	Clean, adjust and check equipment damage as required
4	**Shut down machine to procedures**	4.1	Determine type of shutdown
		4.2	Select appropriate cleaning method
		4.3	Clean efficiently and adequately as required
		4.4	Leave machine in appropriate condition and with appropriate locks, tags or notices
		4.5	Complete relevant documentation
		4.6	Ensure area is clean and clear after the shutdown, in readiness for the next start-up
5	**Anticipate and solve problems**	5.1	Recognise a problem or a potential problem
		5.2	Determine problems needing priority action
		5.3	Refer problems outside area of responsibility to appropriate person, with possible causes
		5.4	Seek information and assistance as required to solve problems
		5.5	Solve problems within area of responsibility
		5.6	Follow through items initiated until final resolution has occurred

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance.

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Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, manual handling and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- moulds
- vacuum bags
- infusion lines
- vacuum pumps and fittings eg hoses and couplings
- programmable logic controllers (PLC) if fitted

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- hand tools used in the this process, e.g. dispensing equipment.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- fibres, airborne and handled
- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- electricity
- gas
- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment, product mass
- other hazards that might arise.

Problems

Non-routine problems must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person.

Non-routine problems are unexpected problems or variations of previous problems and include one or more of:

- variations in quality
- emergency situations
- mould release problems
- stoppage of resin flow

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- excess resin
- warping or cracking after moulding
- variations in vacuum
- variations affecting cure rate
- intermittent faults.

Operational knowledge includes one or more of:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD391B Produce composites using resin infusion

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD391 Produce composites using resin infusion

Modification History

Release 1. Supersedes and is equivalent to PMBPROD391B Produce composites using resin infusion

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, instruments/control panels, material labels and safety data sheets (SDS)
- set up resin infusion equipment and materials to meet specifications
- start up and operate the equipment
- monitor key variables, including:
  - operating temperatures
  - cycle time (such as the resin filling time)
  - output rate
  - vacuum pressure
  - surface finish and condition
  - equipment - adjustments/set-up
  - product weight product integrity and general conformance to specification
- make adjustments to remedy faults and non-conformity
- maintain output and product quality using appropriate instruments, controls, test information and readings
- safely shut down equipment in normal and abnormal circumstances
- leave machine in appropriate condition with any required locks, tags or notices
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- distinguish between causes of problems, including:
  - operational problems
  - instrument failure/malfunction
  - electrical failure/malfunction
  - mechanical failure/malfunction
  - wrong readings

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  - equipment design deficiencies
  - materials properties
  - process variables
- recognise and prioritise problems requiring action
- resolve non-routine problems
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate independently and to solve routine and non-routine problems including knowledge of:

- resin infusion manufacturing process and phases of the cycle
- characteristics of materials and their behaviour in relation to process conditions and stages of production
- quality requirements at each production stage
- mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation
- common adjustments in process variables and their impact on product quality and production output
- impact of variations in raw materials and equipment operation in relation to final product
- possible changes to materials properties to better suit specific process requirements
- non-routine problems that may arise, the range of possible causes and appropriate actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
  - their possible causes
  - potential consequences
  - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
  - teamwork
  - communication.
- Where the assessee does not currently possess evidence of competency in *PMBPROD291 Operate resin infusion moulding equipment*, it may be co-assessed with this unit.
- The collection of performance evidence:

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  - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant
  - will typically include a supervisor/third-party report or other evidence, focussing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
  - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems
  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions

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  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
  - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
  - conducting on the job training/assessments of the type of work being assessed
  - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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PMBPROD394 Produce composites using resin transfer moulding

Modification History

Release 1. Supersedes and is equivalent to PMBPROD394B Produce composites using resin transfer moulding

Application

This unit of competency covers the skills and knowledge required to operate and adjust resin transfer moulding processes to produce product.

This unit of competency applies to experienced operators who are required to start up and shut down resin transfer equipment, monitor equipment operation, establish a stable process, make adjustments to remedy faults and non-conformity and solve problems within area of responsibility.

This unit of competency applies to an experienced operator demonstrating theoretical and technical knowledge and well developed skills in situations that require some discretion and judgement. The operator may work alone or as a member of a team or group and will work in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

PMBPROD294 Operate resin transfer moulding equipment

Competency Field

Production

Unit Sector

Not applicable

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Plan own work requirements**	1.1	Identify the most appropriate equipment to be used for production and upstream and downstream operations from production plan or request
		1.2	Identify and check materials required, including additives
		1.3	Implement measures to control identified hazards in line with procedures and duty of care
		1.4	Identify requirements for materials, quality, production and equipment checks
2	**Start up resin transfer moulding process to procedures**	2.1	Identify process settings required for the product
		2.2	Adjust control panel to required settings
		2.3	Check materials, resins, fibres and cores are correct
		2.4	Take appropriate action for non-conforming materials
		2.5	Set up date, batch and materials markings to specifications, as required
		2.6	Complete pre-start checks
		2.7	Start up process
3	**Operate and make adjustments as required to the resin transfer moulding process to procedures**	3.1	Operate resin transfer moulding process, noting key variables
		3.2	Monitor controls/displays/terminals for production/process data
		3.3	Monitor product/process quality, thickness and integrity to procedures
		3.4	Take samples as required and identify product out-of-specification
		3.5	Make adjustments to remedy faults and nonconformity to standard, as required

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		3.6	Establish a stable resin transfer moulding process
		3.7	Adjust process to minimise scrap and waste
		3.8	Clean, adjust and lubricate equipment as required
4	**Shut down machine to procedures**	4.1	Determine type of shutdown
		4.2	Select appropriate purging method
		4.3	Purge efficiently and adequately as required
		4.4	Leave machine in appropriate condition and with appropriate locks, tags or notices
		4.5	Complete relevant documentation
		4.6	Ensure area is clean and clear after the shutdown, in readiness for the next start-up
5	**Anticipate and solve problems**	5.1	Recognise a problem or anticipate potential problems
		5.2	Determine problems needing priority action
		5.3	Refer problems outside area of responsibility to appropriate person, with possible causes
		5.4	Seek information and assistance as required to solve problems
		5.5	Solve problems within area of responsibility
		5.6	Follow through items initiated until final resolution has occurred

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

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Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, manual handling and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- resin transfer moulding equipment
- moulds

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- resin pumps and fittings
- programmable logic controllers (PLC) if fitted
- ancillary equipment that is integral to the process.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids, such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- fibres (airborne and handled)
- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- high temperatures
- electricity
- gas
- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment and product mass
- other hazards that might arise.

Problems

Non-routine problems must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person.

Non-routine problems are unexpected problems or variations of previous problems and include one or more of:

- unstable process variables

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- sub-optimal operation
- variations in feed rates
- variations in quality
- emergency situations
- intermittent faults.

Operational knowledge includes one or more of:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD394B Produce composites using resin transfer moulding

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD394 Produce composites using resin transfer moulding

Modification History

Release 1. Supersedes and is equivalent to PMBPROD394B Produce composites using resin transfer moulding

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, instruments/control panels, material labels and safety data sheets (SDS)
- set up resin transfer moulding equipment and materials to meet specifications
- start up and operate the equipment
- monitor key variables, including:
  - operating temperatures
  - cycle time
  - output rate
  - surface finish and condition
  - product weight
  - product integrity and general conformance to specification
- make adjustments to remedy faults and non-conformity
- maintain output and product quality using appropriate instruments, controls, test information and readings
- safely shut down equipment in normal and abnormal circumstances
- leave machine in appropriate condition with any required locks, tags or notices
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- distinguish between causes of problems, including:
  - operational problems
  - instrument failure/malfunction
  - electrical failure/malfunction
  - mechanical failure/malfunction
  - wrong readings
  - equipment design deficiencies

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  - materials properties
  - process variables
- recognise and prioritise problems requiring action
- resolve non-routine problems
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate independently and to solve routine and non-routine problems, including knowledge of:

- resin transfer moulding manufacturing process and phases of the cycle
- characteristics of materials and their behaviour in relation to process conditions and stages of production
- quality requirements at each production stage
- mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation
- common adjustments in process variables and their impact on product quality and production output
- impact of variations in raw materials and equipment operation in relation to final product
- possible changes to materials properties to better suit specific process requirements
- non-routine problems that may arise, the range of possible causes and appropriate actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
  - their possible causes
  - potential consequences
  - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
  - teamwork
  - communication.
- Where the assessee does not currently possess evidence of competency in *PMBPROD294 Operate resin transfer moulding equipment*, it may be co-assessed with this unit.
- The collection of performance evidence:
  - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant

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  - will typically include a supervisor/third-party report or other evidence, focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
  - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems
  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions

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- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
  - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
  - conducting on the job training/assessments of the type of work being assessed
  - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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PMBPROD398 Produce composites using pre-pregs

Modification History

Release 1. Supersedes and is equivalent to PMBPROD398B Produce composites using pre-pregs

Application

This unit of competency covers the skills and knowledge required to operate and adjust equipment and processes which use pre-pregs to produce composite product.

This unit of competency applies to experienced operators who are required to start up and shut down the equipment, monitor equipment operation, establish a stable process, make adjustments to remedy faults and non-conformity and solve problems within area of responsibility.

This unit of competency applies to an experienced operator demonstrating theoretical and technical knowledge and well developed skills in situations that require some discretion and judgement. The operator may work alone or as a member of a team or group and will work in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

PMBPROD298 Operate equipment using pre-pregs material

Competency Field

Production

Unit Sector

Not applicable

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Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1	**Plan own work requirements**	1.1	Identify equipment and processes used for production process and upstream and downstream operations from production plan or request
		1.2	Identify materials required, including additives
		1.3	Recognise hazards and follow appropriate hazard control/minimisation methods
		1.4	Identify and check emergency stops, guards and controls
		1.5	Identify requirements for materials, quality, production and equipment checks
		1.6	Identify materials, waste management and housekeeping needs
2	**Start up pre-preg process**	2.1	Determine equipment requirements
		2.2	Adjust control panel to required settings
		2.3	Check equipment, raw material and die/tool all match job requirements
		2.4	Check materials, pre-pregs, release agents, and so on, are correct
		2.5	Discard, or make adjustments to the process for, non-conforming materials
		2.6	Set up date, batch and materials markings to specifications, as required
		2.7	Complete other pre-start checks in accordance with procedures
		2.8	Start up pre-preg process
3	**Operate and make adjustments as required to the**	3.1	Operate composites forming equipment, noting key variables
		3.2	Monitor controls/displays/terminals for production/process data

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	process	3.3	Monitor product/process quality, thickness and integrity to procedures
		3.4	Make adjustments to remedy faults and non-conformity to standard as required
		3.5	Maintain continuity of process
		3.6	Collect and reprocess/discard scrap/waste and other materials in accordance with procedures
		3.7	Clean, adjust and lubricate equipment as required
		3.8	Pause or stop equipment in an emergency, following procedures
4	**Shut down machine to procedures**	4.1	Determine type of shutdown
		4.2	Select appropriate cleaning method
		4.3	Clean efficiently and adequately as required
		4.4	Leave machine in appropriate condition and with appropriate locks, tags or notices
		4.5	Complete relevant documentation
		4.6	Ensure area is clean and clear after the shutdown, in readiness for the next start-up
5	**Anticipate and solve problems**	5.1	Recognise a problem or a potential problem
		5.2	Determine problems needing priority action
		5.3	Refer problems outside area of responsibility to appropriate person, with possible causes
		5.4	Seek information and assistance as required to solve problems
		5.5	Solve problems within area of responsibility
		5.6	Follow through items initiated until final resolution has occurred

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Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, manual handling and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes

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- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- moulds
- moulding equipment and closures
- programmable logic controllers (PLC) if fitted
- ancillary equipment that is integral to the process
- hand tools used in the this process.

Additional tools and equipment will be selected as required from:

- hoists/lifting equipment not requiring any special permits or licences
- manual handling aids, such as hand carts and trolleys
- relevant personal protective equipment (PPE).

Hazards

Hazards must be identified and controlled. Identifying hazards requires consideration of:

- hazardous products and materials
- sharp edges, swarf and scrap
- protrusions or obstructions
- slippery surfaces, spills or leaks
- rotational equipment or vibration
- smoke, dust, vapours or other atmospheric hazards
- high temperatures
- electricity
- gas
- gases and liquids under pressure
- structural hazards
- equipment failures
- machinery, equipment and product mass
- other hazards that might arise.

Problems

Non-routine problems must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes

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- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person.

Non-routine problems are unexpected problems or variations of previous problems and include one or more of:

- unstable process variables
- sub-optimal operation
- variations in quality
- emergency situations
- warped moulds or dies
- worn or damaged mould parts or fittings
- intermittent faults.

Operational knowledge includes one or more of:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBPROD398B Produce composites using pre-pregs

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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Assessment Requirements for PMBPROD398 Produce composites using pre-pregs

Modification History

Release 1. Supersedes and is equivalent to PMBPROD398B Produce composites using pre-pregs

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, instruments/control panels, material labels and safety data sheets (SDS)
- set up pre-preg equipment and materials to meet specifications
- start up and operate the equipment
- monitor key variables, including:
  - operating temperatures
  - cycle time
  - output rate
  - surface finish and condition
  - product weight
  - product integrity and general conformance to specification
- make adjustments to remedy faults and non-conformity
- maintain output and product quality using appropriate instruments, controls, test information and readings
- safely shut down equipment in normal and abnormal circumstances
- leave machine in appropriate condition with any required locks, tags or notices
- identify hazards and apply relevant hazard controls
- apply safety procedures
- apply housekeeping procedures
- apply waste management procedures
- recognise early warning signs of equipment/processes needing attention or with potential problems
- distinguish between causes of problems, including:
  - operational problems
  - instrument failure/malfunction
  - electrical failure/malfunction
  - mechanical failure/malfunction
  - wrong readings
  - equipment design deficiencies

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  - materials properties
  - process variables
- recognise and prioritise problems requiring action
- resolve non-routine problems
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate independently and to solve routine and non-routine problems, including knowledge of:

- pre-preg manufacturing processes and phases of the cycle
- characteristics of common pre-pregs and their behaviour in relation to process conditions and stages of production
- quality requirements at each production stage
- mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation
- common adjustments in process variables and their impact on product quality and production output
- impact of variations in raw materials and equipment operation in relation to final product
- possible changes to materials properties to better suit specific process requirements
- non-routine problems that may arise, the range of possible causes and appropriate actions
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
  - their possible causes
  - potential consequences
  - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- In all plants it may be appropriate to assess this unit concurrently with units such as:
  - teamwork
  - communication.
- Where the assessee does not currently possess evidence of competency in *PMBPROD298 Operate equipment using pre-preg* material, it may be co-assessed with this unit.
- The collection of performance evidence:
  - should occur over a range of situations which include typical disruptions to normal, smooth operation of an operating plant

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  - will typically include a supervisor/third-party report or other evidence, focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
  - must include the use of an appropriate industrial item of equipment requiring demonstration of operation, start and stop procedures and responding to problems
  - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
  - walk-throughs
  - pilot plant operation
  - industry-based case studies/scenarios
  - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions

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- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
  - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
  - conducting on the job training/assessments of the type of work being assessed
  - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090

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TLILIC0002 Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Application

This unit specifies the skills and knowledge required to safely operate a vehicle loading crane with a Maximum Rated Capacity (MRC) of 10 metre tonnes or more. Competence in this unit, does not in itself result in a HRWL licence to operate this plant.

Vehicle loading crane means a crane mounted on a vehicle for loading and unloading the vehicle.

A person undertaking this unit must hold:

- a current National High-Risk Work Licence (HRWL) to perform dogging or a certification for a specific VET course for HRWL to perform dogging.

A person performing this work is required to hold a vehicle loading crane HRWL.

This unit requires a person operating a slewing vehicle loading crane with an MRC of 10 metre tonnes or more to:

- plan for the work/task
- prepare for the work/task
- perform work/task
- pack up

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit of competency.

This unit is based on the licensing requirements of Part 4.5 of the Model Work Health and Safety (WHS) Regulations and meets Commonwealth, State and Territory HRWL requirements.

The National Assessment Instrument (NAI) is the mandated assessment for the HRWL to operate the relevant licencing class as detailed in this unit.

Pre-requisite Unit

Not applicable

Competency Field

LIC - Licencing Units

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Unit Sector

Not applicable

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Plan work/task	**1.1** Task requirements are identified from work orders or equivalent and a lift plan is confirmed with associated personnel and a site inspection is conducted in accordance with workplace procedures
	1.2 Work area operating surface is confirmed to determine the quality of ground suitability for operational use of vehicle loading crane in accordance with workplace procedures
	1.3 Vehicle loading crane rated capacity (RC) and the lifting gear Working Load Limit (WLL) are established for the load/s and work/task requirements in accordance with manufacturer requirements and workplace procedures
	1.4 Appropriate paths for operating the vehicle loading crane and moving and placing load/s in work area are assessed and determined in accordance with workplace procedures
	1.5 Relevant hazard identification and risk elimination/control measures are applied and advised to associated personnel in accordance with workplace procedures
	1.6 Traffic management plan implementation is confirmed and followed in accordance with workplace procedures
	1.7 Appropriate communication procedures are identified and tested with associated personnel in accordance with workplace procedures

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	1.8	All tasks are confirmed to ensure requirements for the relevant work area in accordance with workplace procedures
Prepare for work/task 2	**2.1**	Consultation with workplace personnel is established and maintained to ensure all crane and lifting operations are clear and consistent with site requirements in accordance with a lift plan and workplace procedures
	2.2	Risk control measures for hazards identified are checked for implementation in accordance with the lift plan and safe work procedures
	2.3	Vehicle loading crane controls are accessed safely in accordance with manufacturer requirements and safe work procedures
	2.4	Pre-start vehicle loading crane checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with safe work procedures and manufacturer requirements
	2.5	Vehicle loading crane is set up correctly with any lifting gear as per the lift plan in accordance with relevant manufacturer requirements including load chart/s and safe work procedures
	2.6	Boom/jib and lifting gear are set up as required in accordance with specific manufacturer requirements and safe work procedures
	2.7	Vehicle loading crane is stabilised appropriately in accordance with the lift plan, relevant manufacturer requirements and safe work procedures
	2.8	Operational checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer requirements and safe work procedures
	2.9	Vehicle loading crane logbook is inspected and is correct for the crane type, is completed and signed and required rectifications have been signed off in accordance with manufacturer requirements and safe work procedures

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		2.10	Weather and work environment conditions are assessed to determine any impact on vehicle loading crane operations in accordance with manufacturer requirements and safe work procedures
3	**Perform work/task**	**3.1**	Lifts are determined within the RC of the vehicle loading crane in accordance with the load chart/s and lift plan
		3.2	Boom/jib and hook block are safely positioned over the load following directions from associated personnel in accordance with the lift plan and safe work procedures
		3.3	Lifting gear is connected to the load and used safely in accordance with the lift plan, safe work procedures and manufacturer requirements
		3.4	Test lift is carried out in accordance with dogging and safe work procedures
		3.5	Loads are transferred using relevant crane movements and tag lines as required, in accordance with lift plan and safe work procedures
		3.6	Load and crane movement is monitored constantly and crane is operated safely in accordance with lift plan and safe work procedures
		3.7	All required communication signals are correctly interpreted and followed whilst crane is operated in accordance with the lift plan and safe work procedures
		3.8	Load is lowered and landed safely in accordance with lift plan and safe work procedures
		3.9	Lifting gear is disconnected from load and crane is positioned safely and efficiently for next task in accordance with lift plan and safe work procedures
4	**Pack up**	**4.1**	Crane boom/jib, lifting gear and associated equipment is stowed and secured as required in accordance with manufacturer requirements and safe work procedures

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4.2 Relevant motion locks and brakes are applied as required in accordance with manufacturer requirements and safe work procedures

4.3 Stabilisers are stowed and secured in accordance with manufacturer requirements and safe work procedures

4.4 Crane is shut down and secured to prevent unauthorised access/use in accordance with safe work procedures

4.5 Plates or packing are stowed and secured in accordance with safe work procedures

4.6 Shut down crane checks are carried out in accordance with safe work procedures and manufacturer requirements

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non -essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to TLILIC0012 Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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Assessment Requirements for TLILIC0002 Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and include:

- applying relevant mathematical calculations in conjunction with lift plan and load chart to determine radius requirements and relevant lifting gear to perform work/task to enable crane to be configured for load including:
  - boom
  - Stabiliser positioning
  - type of hook
- conducting and applying risk and hazard assessment strategies including:
  - confirming work area operating surface suitability based on crane and task requirements
  - dynamic loads
  - ground conditions including condition of surface and slopes
  - load swing
  - overloading
  - lifting and placing load
  - tyre pressures/track condition
  - asymmetric loads
  - overhead hazards including electric lines and service pipes
  - restricted and poorly ventilated areas
  - risk of collision with people, moving plant and fixed structures
  - adequate lighting
  - traffic including pedestrians, vehicles and other plant
  - weather conditions
- confirming and following traffic management plan procedures relevant to their role in the work area
- complying with Commonwealth, state and territory Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislation
- communicating with other associated personnel through using appropriate worksite procedures which including:

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  - 2-way radio
  - active listening
  - demonstrating and interpreting hand signals
  - questioning to confirm understanding
  - signage
  - whistles
  - written instructions
- maintaining three points of contact whilst accessing load surface area of vehicle loading crane and ensure rungs / steps are free of hazards
- completing the pre-start check including:
  - engine / mechanical fluid level checks as required by manufacturer requirements
  - presence of correct logbook
  - evidence of damage
  - fluid leaks
  - lights work effectively
  - locating, identifying and confirming all controls
  - fire extinguisher
  - safety equipment checks
  - signage and labels to ensure they are visible and legible
  - checking for signs of paint separation and stressed welds indicating potential structural weakness
  - tyres and wheels for damage/wear and correct inflation
  - updating records as required
  - visual damage or equipment faults
- identifying, isolating, and tagging out defective equipment and reporting to authorised person/s
- inputting crane configuration into crane computer as required and checking operation to accurately reflect crane configuration
- carrying out operational checks ensuring:
  - all controls are located, identified and tested for functionality
  - all hydraulic functions are operated
  - lifting gear movements and control functions are smooth and comply with lift plan
  - hazard warning systems, safety, audible and visual warning devices are checked for to ensure they are functional including:
    - reversing beepers
    - lights
    - horns
  - start-up is in accordance with manufacturer requirements and safe work procedures
  - there are no unusual noises
  - crane control functions comply with operating requirements
- determining any defects or faults with operation of crane and reporting to relevant person/s

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- ensuring risk control measures within the work area are effective as per workplace procedures
- interpreting and confirming relevant documentation for the work task and relevant area
- monitoring load disconnection from hook is safe and ensuring no movement of controls
- applying relevant communication signals from associated personnel
- operating a vehicle loading crane of 10metre tonnes or greater configured to its rated capacity (RC) to lift and move four different loads using the main hook through an obstacle course using all crane operational controls while the load is in full view of the crane operator. Loads must consist of:
  - a load of >50% of the Rated Capacity (RC) of the crane with a boom length of >75%, and
  - a round load with a minimum diameter of 300 mm and minimum length of 3 m that requires a dogger to sling, and
  - an asymmetrical load that requires a dogger to sling, and
  - stillage containing at least ten scaffolding standards or containing a load of steel pipes of equivalent weight that requires a dogger to sling
- applying relevant crane movements including:
  - boom/jib up and down (luffing)
  - catching load swing appropriately
  - positioning and using main and auxiliary hook and lifting gear to connect to load safely
  - raise and lower hoist
  - slew boom/jib
  - telescope in and out
- positioning vehicle loading crane in relevant area for next task
- setting up and validating an exclusion zone
- positioning the vehicle loading crane for safe operation for:
  - application of the task
  - manoeuvring in the workplace
  - stability of the vehicle loading crane and the load
- recording and maintaining accurate information relating to crane operations
- reporting to relevant person/s on site risk control measures that are not in place or deficient
- shutting down a vehicle loading crane in accordance with manufacturer requirements and safe work procedures
- stabilising a vehicle loading crane for operation by:
  - correctly positioning plates or packing
  - deploying stabilisers
  - establishing correct size plates or packing in accordance with lift plan
  - levels are checked
- test-lifting load just clear of lifting plane to allow for checks to be safely made in consultation with associated personnel to ensure:
  - slinging is correct
  - all crane equipment is functioning properly

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    - load centre of gravity is correct
    - loads of unusual shape or weight distribution are correctly slung
- test-lifting load just clear of lifting plane to allow for checks of crane computer (where fitted) to ensure:
    - load measuring equipment can be used to verify calculated weight of load
    - near capacity loads do not overload crane
- using communications signals including:
    - hoist down - hand and whistle and radio
    - hoist up - hand and whistle and radio
    - luff boom down - hand and whistle and radio
    - luff boom up - hand and whistle and radio
    - slew left - hand and whistle and radio
    - slew right - hand and whistle and radio
    - stop - hand and whistle and radio
    - telescope in - hand and whistle and 2-way radio (where manufacturer requirements allow)
    - telescope out - hand and whistle and 2-way radio (where manufacturer requirements allow)

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- mathematical calculations to:
    - estimate loads
    - radius requirements
    - relevant lifting gear to perform work/task
- appropriate worksite communication procedures including:
    - listening
    - hand signals
    - questioning techniques
    - signage
    - two-way radios
    - written instructions
    - whistles
- characteristics and impact of factors affecting vehicle loading crane stability whilst moving loads including:
    - overloading
    - poor load placement
    - asymmetric loads
    - tyre deflation/condition

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- crane, lifting gear load chart/s and manufacturer requirements
- lift impacting factors including:
  - centre of gravity
  - dynamic nature of load
  - flex/deflexion of load
  - length
  - radius of lift
  - weight
- set up of:
  - jib
  - fly jib (where fitted)
- hazards including:
  - pack up and crane stability, crane tipping and demolition sites
  - ground stability including ground condition, recently filled trenches and slopes
  - insufficient lighting
  - obstacles or obstruction
  - other specific hazards and dangerous materials
  - overhead hazards including:
    - electric lines
    - service pipes
    - fixed structures
    - vegetation (trees)
  - traffic including pedestrians, vehicles and other plant
  - operations on unusual, uneven or difficult terrains
- manufacturer requirements on stabiliser procedures
- manufacturer requirements and instructions on shutting down and packing up crane
- vehicle loading crane characteristics and capabilities to allow crane configuration to suit a range of loads
- relevant workplace instructions, safety information, emergency procedures
- relevant documentation requirements and procedures for recording, reporting and maintaining workplace records and information
- risk assessment management and mitigation strategies including hierarchy of control:
  - elimination
  - substitution
  - isolation
  - engineering controls
  - administrative controls
  - personal protective equipment (PPE)
- roles and responsibilities of duty holders as per legislative obligations of Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) requirements and safe work / workplace procedures

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- prestart and operational checks required for a vehicle loading crane
- starting procedure of crane as per manufacturer requirements
- weather bureau forecasts and environmental conditions that could impact operation including:
  - lightning
  - wind
  - water impacted ground
  - Ultra Violet (UV) exposure
- problems and appropriate response procedures to unplanned and/or unsafe situations and environmental conditions
- stability of load and avoidance of hazards using best crane practice including:
  - allowing for boom deflection
  - boom/jib as low as possible
  - carrying load near to ground surface
  - crane stability
  - gently accelerating and braking on slew/boom to minimise load swing
  - lowering load safely onto appropriate dunnage taking into consideration swing and restrictions of area
  - minimum boom/jib length
  - minimum speed
  - using handheld taglines as required
  - identification of incorrect sling of load
- workplace standards, requirements, policies and procedures for conducting operations for the vehicle loading crane
- work area suitability based on relevant ground reports including:
  - backfilled ground
  - bitumen
  - concrete
  - hard compacted soil
  - pre-contaminated soils
  - rock
  - rough uneven ground
  - soft soils

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of

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assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

- Simulators must not be used in the assessment of this unit of competency.

Accredited assessors assessing for this HRWL on behalf of the regulator are responsible for ensuring candidates must have access to resources for assessment that must include access to:

- vehicle loading crane with a MRC of greater than 10 metre tonnes in safe/serviceable working order in accordance with manufacturers specifications
- appropriate loads as outlined in the performance evidence requirements
- appropriate personnel to sling and direct loads including:
  - dogger or rigger
- communications equipment including:
  - two-way radios
  - whistles
- relevant personal protective equipment (PPE)
- relevant documentation for operating a vehicle loading crane with an MRC of greater than 10 metre tonnes including:
  - approved codes of practice and guidance
  - Australian Standards
  - checklists
  - safe work operating procedures
  - relevant industry standards (where applicable)
  - logbook
  - manufacturer guidelines (instructions, specifications or checklists)
  - relevant workplace documentation

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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TLILIC0003 Licence to operate a forklift truck

Modification History

Release 1. This is a release of this unit of competency in the TLI Transport and Logistics Training Package.

Application

This unit specifies the skills and knowledge required to operate a forklift truck safely in accordance with all relevant legislative requirements. Competence in this unit, does not in itself result in a HRWL licence to operate this plant.

Forklift truck means a powered industrial truck equipped with lifting media made up of a mast and an elevating load carriage to which is attached a pair of fork arms or other attachments that can be raised 900 mm or more above the ground, but does not include a pedestrian-operated truck or a pallet truck.

A person performing this work is required to hold a forklift truck High Risk Work Licence (HRWL).

This unit requires a person operating a forklift truck to:

- plan for the work/task
- prepare for the work/task
- perform work/task
- pack up

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit of competency.

This unit is based on the licensing requirements of Part 4.5 of the Model Work Health and Safety (WHS) Regulations and meets Commonwealth, State and Territory HRWL requirements.

The National Assessment Instrument (NAI) is the mandated assessment for the HRWL to operate the relevant licencing class as detailed in this unit.

Pre-requisite Unit

Not applicable

Competency Field

LIC - Licencing Units

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Unit Sector

Not applicable

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Plan work/task	**1.1** Task requirements are identified from work orders or equivalent and confirmed with relevant people and site inspection is conducted in accordance with workplace procedures
	1.2 Work area operating surface is assessed to determine suitability for operational use of forklift truck in accordance with workplace procedures
	1.3 Suitability of forklift truck and attachment working load limit (WLL) is determined for the load/s and work/task requirements in accordance with manufacturer requirements and workplace procedures
	1.4 Working area is inspected and appropriate paths for operating the forklift truck and moving and placing load/s in work area are assessed and managed in accordance with workplace procedures
	1.5 Hazard and risk control measures are identified and reported to relevant person/s in accordance with workplace procedures
	1.6 Traffic management plan implementation is confirmed in accordance with workplace procedures
	1.7 Appropriate communication procedures are identified with relevant people in accordance with workplace procedures
	1.8 All work is confirmed to ensure coverage of work/task requirements for the relevant work area is in accordance with workplace procedures

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2 Prepare for work/task	**2.1**	Consultation with workplace person/s is maintained to ensure workplan is clear and consistent with site requirements in accordance with safe work procedures
	2.2	Weather and work environmental conditions are assessed to determine any impact on forklift truck operations in accordance with manufacturer requirements and safe work procedures
	2.3	Risk control measures for hazards identified are checked for implementation in accordance with safe work procedures
	2.4	Forklift truck is accessed in a safe manner in accordance with manufacturer requirements and workplace procedures
	2.5	Forklift truck logbook is checked in accordance with manufacturer, regulatory requirements and safe work procedures
	2.6	Pre-start checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with safe work procedures and manufacturer requirements
	2.7	Forklift truck is set up correctly with any relevant attachments as per work plan in accordance with relevant manufacturer requirements including data plate and safe work procedures
	2.8	Operational checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer requirements and safe work procedures
	2.9	Hazard and risk control measures are checked for implementation and communicated to people in the work area in accordance with safe work procedures
3 Perform work/task	**3.1**	Weight and positioning of load is assessed to ensure compliance with forklift truck data plate requirements and in accordance with safe work procedures

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	3.2	Forklift truck is operated safely in accordance with manufacturer requirements and safe work procedures
	3.3	Loads are monitored constantly when lifting, moving, lowering and placing to ensure stability of load and avoidance of hazards in accordance with safe work procedures
	3.4	Unplanned and unsafe situations are responded to in accordance with safe work procedures
	3.5	Loads are picked up, transported and placed using all forklift truck movements in accordance with safe work procedures
	3.6	Forklift truck is parked, switched off and isolated appropriately in accordance with manufacturer requirements and safe work procedures
4 Pack Up	**4.1**	Forklift truck shutdown procedures are carried out in accordance with manufacturer requirements and safe work procedures
	4.2	Forklift truck is secured to prevent unauthorised access/use in accordance with safe work procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to TLILIC2001 Licence to operate a forklift truck

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Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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Assessment Requirements for TLILIC0003 Licence to operate a forklift truck

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and include:

- applying safe operating procedures for a forklift truck including:
  - maintaining safe operating speed
  - travelling with load lowered to an appropriate height for the terrain, operating surface and visibility in relation to direction of travel
- applying relevant forklift truck manufacturer requirements and data plate information and approved modifications to attachments fitted are in accordance with manufacturer requirements
- carrying out pre-start checks, including visual inspection which must include:
  - battery charge as required by manufacturer requirements
  - checking and interpreting data plate/s are relevant to the attachment and the forklift truck
  - checking for signs of paint separation and stressed welds indicating potential structural weakness
  - document evidence of damage
  - engine / mechanical fluid level checks including fuel as required by manufacturer requirements
  - ensuring availability of correct forklift truck logbook and updating records as required
  - ensuring forklift truck tynes or other attachment/s are securely fitted
  - ensuring seat and mirrors are adjusted appropriately and seat belt is functional
  - fluid leaks
  - lights are working effectively
  - safety equipment checks
  - signage and labels to ensure they are visible and legible
  - wheels and tyres for damage/correct inflation if applicable
- conducting and applying risk and hazard assessment strategies including:
  - insufficient lighting
  - other specific hazards including dangerous goods
  - overhead hazards and fixed structures, roof beams and doorways
  - restricted and poorly ventilated areas

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  - surface suitability based on forklift truck and task requirements
  - the risk of collision with people, moving plant and fixed structures
  - weather conditions
- complying with Commonwealth, State and Territory Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislation, regulations safe work and workplace procedures
- conducting operational checks, which must ensure:
  - all controls are located, identified and tested for functionality
  - all hydraulic functions operated to maximum extension and ensuring attachment (if fitted) movements and control functions are smooth and comply with operating requirements
  - hazard warning systems (e.g. reversing beepers, lights and horns) are functional
  - recording and maintaining accurate information relating to forklift truck operations
  - safety devices as fitted
  - start-up is in accordance with manufacturer requirements
  - steering, transmission and brake functions comply with operating requirements
  - there are no unusual noises
- confirming and following traffic management plan procedures relevant to their role in the work area
- conducting relevant procedures for refuelling and isolating fuel/power source as per manufacturer requirements using appropriate PPE
- determining relevant lifting attachment to perform work/task
- determining lift requirements including:
  - positioning of unusually balanced/shaped loads
  - centre of gravity
  - dynamic nature of load
  - tyne/attachment positioning
  - weight
- ensuring risk control measures within the work area are effective as per workplace procedures
- identifying, isolating and tagging out defective equipment and reporting to authorised person/s
- interpreting and confirming relevant documentation, workplace instructions, safety information, emergency procedures for the work task and relevant area
- interpreting workplace procedures in relation to various environmental conditions
- maintaining communication with other workplace personnel through using worksite procedures including:
  - audible and visual warning devices
  - signage
  - two-way radio
  - verbal instructions
  - written instructions
- maintaining three points of contact whilst accessing and egressing forklift truck and ensuring

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rungs / steps are free of hazards
- operating and monitoring safe forklift truck operations using minimum 250kg dynamic and non-dynamic loads that include:
  - aligning tynes/attachment to load
  - carrying out a lift to 75% of the maximum height
  - conducting trial lift to ensure forklift truck and load are stable, and load is safe to move
  - correctly using horns and mirrors in workplace
  - correctly positioning and using an observer to assist when operating with a load that may restrict vision or be placed out of vision of the operator
  - driving applicable to conditions and moving loads safely
  - driving a forklift truck safely with load in forward and reverse, while maintaining visibility through an obstacle course including:
    - an 'S' bend with a minimum 90 degrees left and right turn
    - ensuring load/s remains stable through pick up, transport and placement
    - forklift truck speed is appropriate to load and surroundings
    - lowering dynamic and non-dynamic loads to appropriate height for travel in forward and reverse
  - picking up, driving, manoeuvring and placing dynamic and non-dynamic loads safely at various heights within a compliant racking system
  - picking up, driving, manoeuvring and placing dynamic and non-dynamic loads safely into/onto an elevated, flat, stable area
  - tilting mast (or forks if applicable) to ensure balance of load
  - using gluts/dunnage appropriately and lowering load safely
  - using tilt and side shift (where fitted) safely to manoeuvre dynamic and non-dynamic loads into allocated space
- reporting to relevant person/s on site risk control measures that are not in place or are deficient
- setting up an exclusion zone
- securely parking forklift truck and isolating in appropriate position including:
  - minimising possible access by unauthorised person/s
  - tynes/attachment lowered to required position in accordance with manufacturer requirements
  - park brake applied
  - switching off, isolating fuel/power source and removing key according to workplace procedures
- shutting down a forklift truck in accordance with manufacturer requirements and workplace procedures

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

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- Australian and industry standards, codes of practice and guidelines to safely operate a forklift truck
- communication procedures including:
  - audible and visual warning devices
  - hand signals
  - questioning techniques
  - signage
  - traffic warning systems
  - two-way radio
  - written instructions
- forklift truck characteristics and capabilities, manufacturer requirements and instructions for any attachments
- impact of the following on the operation of the forklift truck including:
  - failure/loss of control including brakes and steering
  - failure of equipment during forklift truck operations
  - forklift truck instability causes including:
    - deterioration of ground condition
    - overloading
    - pick up and placement of load
    - irregular loads
  - operating on ramps and uneven surfaces and in restricted spaces
  - use of forklift truck data plate and attachment data plate and appropriate methodology to determine weight of a load is appropriate for forklift truck and any attachment if fitted including the estimation or determination from:
    - labels on the actual load
    - markings on the actual load
    - paperwork such as consignment notes, running sheets and weighbridge dockets
    - weighing a carton and calculating load
- manufacturer requirements, instructions and operator's manual
- problems, and appropriate response procedures to unplanned and/or unsafe environmental conditions including:
  - wind
  - lightning
  - water/ice impacted surface/ground
  - rain
  - extreme heat
  - Ultra violet (UV) exposure
- problems and equipment faults, and implementing appropriate response procedures to unplanned and/or unsafe situations including:
  - lock out and tag out procedures
- relevant procedures for refuelling and recharging forklift truck using appropriate PPE

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including:

- gas bottle
- connecting battery to charger and disconnecting battery from charger and reconnecting to forklift truck
- refuelling

- procedures for recording, reporting and maintaining workplace records and information
- risk assessment process including hierarchy of control:
  - elimination
  - substitution
  - isolation
  - engineering controls
  - administrative controls
  - personal protective equipment (PPE)
- safe use and compliance of different types of attachments including:
  - bale clamps
  - carpet spike for carpet rolls
  - drum carrier
  - jib attachment
  - paper roll clamps
  - personnel work platforms
  - rotators
  - slippers/fork extensions on tynes
- suitability and lifting capability of the attachment to be used
- shut down procedures for a forklift truck in accordance with manufacturer requirements
- traffic management plan procedures and requirements
- typical routine problems encountered operating a forklift truck and associated equipment, and adjustments required for correction
- workplace procedures including work plan which may be verbal, documented/written, or electronically generated
- work area operating surface suitability including issues with:
  - backfilled ground
  - bitumen (damaged, cracked)
  - concrete (damaged, cracked)
  - hard compacted soil
  - potholes
  - railway tracks
  - rough uneven or difficult terrain including sloping surfaces, uneven surfaces, steel decks and grates
  - soft soils
  - trench covers
- Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety

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and Health (OSH) requirements, safe work and workplace procedures

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

- Simulators must not be used in the assessment of this unit of competency.

Resources for assessment must include access to:

- a suitable forklift truck that complies with AS 2359 Powered industrial trucks and is in a safe/serviceable condition in accordance with manufacturer requirements
- associated equipment for forklift truck operations
- suitable dynamic and non-dynamic loads
- suitable compliant racking system
- relevant and appropriate materials, tools, equipment and personal protective equipment currently used in industry
- applicable documentation including:
  - approved codes of practice and relevant guidance material
  - relevant Australian technical standards
  - manufacturer guidelines (instructions, requirements or checklists), relevant industry standards and operating procedures (where applicable)

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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TLILIC0004 Licence to operate an order picking forklift truck

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Application

This unit specifies the skills and knowledge required to operate an order picking forklift truck safely in accordance with all relevant legislative requirements. Competence in this unit, does not in itself result in a HRWL licence to operate this plant.

Order picking forklift truck means an order picking forklift truck where the operator controls are incorporated with the lifting media and elevate with the lifting media.

A person performing this work is required to hold an order picking forklift truck High Risk Work Licence (HRWL).

This unit requires a person operating an order picking forklift truck to:

- plan for the work/task
- prepare for the work/task
- perform work/task
- pack up

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit of competency. This unit is based on the licensing requirements of Part 4.5 of the Model Work Health and Safety (WHS) Regulations and meets Commonwealth, State and Territory HRWL requirements.

The National Assessment Instrument (NAI) is the mandated assessment for the HRWL to operate the relevant licencing class as detailed in this unit.

Pre-requisite Unit

Not applicable

Competency Field

LIC - Licencing Units

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Unit Sector

Not applicable

Elements and Performance Criteria

ELEMENTS		PERFORMANCE CRITERIA
Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Plan work/task	**1.1**	Task requirements are identified from work orders or equivalent and confirmed with relevant people and a site inspection is conducted in accordance with workplace procedures
	1.2	All work is confirmed to ensure coverage of work/task requirements for the relevant work area is in accordance with workplace procedures
	1.3	Order picking forklift truck is selected using relevant methodology in accordance with type and weight characteristics of load, workplace conditions, manufacturer specifications and workplace procedures
	1.4	Working area is inspected and appropriate paths for operating the order picking forklift truck and moving in work area are assessed and determined in accordance with workplace procedures
	1.5	Traffic management plan implementation is confirmed and understood in accordance with workplace procedures
	1.6	Appropriate communication procedures are identified and tested with relevant people in accordance with workplace procedures
	1.7	Work area operating surface is assessed to determine quality and suitability for operational use in accordance with workplace procedures
2 Prepare for work/task	**2.1**	Consultation with workplace person/s is maintained to ensure workplan is clear and consistent with site requirements in accordance with workplace procedures

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	2.2	Environmental work area conditions are assessed to determine any impact on order picking forklift truck positioning in accordance safe work procedures
	2.3	Risk control measures for hazards identified are checked for implementation in accordance with safe work procedures
	2.4	Order picking forklift truck is accessed in a safe manner in accordance with manufacturer specifications and safe work procedures
	2.5	Order picking forklift truck logbook is inspected and is correct for the order picking forklift truck, is completed, signed and required rectifications have been signed off in accordance with manufacturer requirements and safe work procedures
	2.6	Pre-start checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with safe work procedures and manufacturer specifications
	2.7	Prior to operation, order picking forklift truck and safety equipment for working at height is visually checked for any damage, defects are reported, recorded and appropriate action is taken in accordance with safe work procedures
	2.8	Order picking forklift truck is started and checked for any abnormal noise in accordance with manufacturer specifications and safe work procedures
	2.9	Operational checks including all safety device/s are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer specifications and safe work procedures
3 Perform work/task	**3.1**	Hazard prevention/control measures are implemented and communicated to people in the work area in accordance with safe work procedures
	3.2	Weight and positioning of load on platform is assessed to ensure compliance with order picking forklift truck data plate specifications in accordance with

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		manufacturer specifications and safe work procedures
	3.3	Order picking forklift truck is operated safely in accordance with manufacturer specifications and safe work procedures
	3.4	Order picking forklift truck path and load/s are monitored constantly when moving, lowering and placing to ensure stability of material and avoidance of hazards in accordance with safe work procedures
	3.5	Loads are transported using all relevant order picking forklift truck movements in accordance with safe work procedures
	3.6	Unplanned and unsafe situations are responded to in accordance with safe work procedures
	3.7	Work is conducted safely at heights and fall arrest/restraint equipment is used safely and efficiently in accordance with safe work procedures
	3.8	Order picking forklift truck is parked and isolated appropriately in accordance with manufacturer specifications and safe work procedures
4 Pack up	**4.1**	Order picking forklift truck is shut down in accordance with manufacturer specifications and safe work procedures
	4.2	Order picking forklift truck is secured to prevent unauthorised access/use in accordance with legislative obligations and safe work procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work

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environment.

Non-essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to TLILIC2002 Licence to operate an order picking forklift truck

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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Assessment Requirements for TLILIC0004 Licence to operate an order picking forklift truck

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and include:

- applying safe operating procedures for an order picking forklift truck including:
  - maintaining safe operating speed
  - travelling with platform lowered to an appropriate height
- applying emergency procedures
- carrying out pre-start checks, including visual inspection which must include:
  - battery charge as required by manufacturer specifications
  - checking data plate is relevant to the attachment being used on the order picking forklift truck
  - fluid level checks as required by manufacturer specifications
  - evidence of damage
  - ensuring availability of correct logbook and updating records as required
  - fluid leaks
  - lights are working effectively
  - safety equipment checks
  - signage and labels to ensure they are visible and legible
  - structural weaknesses including paint separation or stressed welds
  - ensuring order picking forklift truck tynes or other attachment/s are securely fitted
  - wheels and tyres for damage/correct inflation if applicable
- conducting and applying risk and hazard assessment strategies including:
  - order picking forklift truck instability due to overloading, poor load placement or irregular loads
  - operating surface conditions and obstructions
  - insufficient lighting
  - overhead hazards
  - restricted and poorly ventilated areas
  - the risk of collision with people, moving plant and fixed structures
- confirming and following traffic management plan procedures relevant to their role in the work area

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- conducting operational checks including:
  - all controls are located, identified and tested for functionality
  - checks for adaptations or modifications outside manufacturer specifications that are not listed on the order picking forklift truck data plate
  - hazard warning systems including travel beepers, lights and horns are functional
- clarifying workplan and checking understanding
- complying with Commonwealth, State and Territory Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislation and regulations
- conducting and monitoring safe order picking forklift truck operations that include:
  - correctly using horns
  - driving applicable to conditions and moving loads safely
  - driving an order picking forklift truck with load in forward and reverse, while maintaining visibility
  - order picking forklift truck speed is appropriate to load and surroundings
  - lowering load to appropriate height for transport
  - carrying out a lift with load to 75% of the maximum height
  - picking up, driving, manoeuvring and placing loads safely at various heights within a compliant racking system
- confirming traffic management plan is implemented
- connecting battery to charger and disconnecting battery from charger and reconnecting to order picking forklift truck
- demonstrating understanding of traffic management plan
- ensuring risk control measures within the work area are effective as per workplace procedures
- inspecting and using relevant safety equipment, including:
  - safety harness/es
  - energy absorber/s
  - lanyard/s
  - anchor point/s
- identifying, segregating and tagging out defective equipment and reporting to authorised person/s
- interpreting and confirming relevant documentation, workplace instructions, safety information, emergency procedures for the work task and relevant area
- maintaining communication with other workplace personnel through using appropriate worksite procedures which must include:
  - audible and visual warning devices
  - listening
  - two-way radio
  - questioning to confirm understanding
  - signage
  - written instructions

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- positioning the order picking forklift truck for safe operation for:
  - application of the task
  - manoeuvring in the workplace
  - stability of the order picking forklift truck and the load
- recording and maintaining accurate information relating to order picking forklift truck operations
- reporting to relevant person/s on site risk control measures that are not in place or deficient
- safety devices are checked, including:
  - safety gates and interlocks
  - emergency hydraulic descent device
  - deadman's switch
- securely parking order picking forklift truck and isolating in appropriate position to minimise possible access by unauthorised person/s including:
  - tynes/attachment/work platform lowered to ground
  - hand/park brake applied
  - switched off and key removed according to manufacturer specifications and workplace procedures
- setting up and validating an exclusion zone
- shutting down an order picking forklift truck in accordance with manufacturer specifications and workplace procedures ensuring access ways are clear
- start-up is in accordance with manufacturer requirements
- steering, transmission and brake functions comply with operating requirements and there are no unusual noises
- verifying problems and equipment faults, and implementing appropriate response procedures to unplanned and/or unsafe situations
- working safely at heights using relevant Personal Protective Equipment (PPE) safely and efficiently

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- Australian and industry standards, codes of practice and guidelines to safely operate an order picking forklift truck
- appropriate worksite communication protocols including:
  - audible and visual warning devices
  - hand signals
  - questioning techniques
  - 2-way radio
  - signage
  - traffic warning systems

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    - written instructions
- hazards including:
    - all operating surface hazards
    - traffic including pedestrians, vehicles, other mobile plant and fixed structures
    - overhead hazards including:
        - electric lines
        - service pipes
        - doorways
        - roof beams
        - lights
        - fixed structures
    - obstacles or obstructions
    - insufficient lighting
    - other specific hazards including falling from platform and dangerous goods
- impact of the following on the operation of the order picking forklift truck including:
    - loss of control of brakes and/or steering
    - failure of equipment including hydraulic system
    - order picking forklift truck instability including:
        - deterioration of operating surface condition
        - overloading
        - picking and placing of irregular loads
- lock out and tag out procedures
- methodology and appropriate mathematical procedures to estimate loads or determination from labels, markings or load paperwork
- manufacturer specifications, instructions and operator's manual
- order picking forklift truck characteristics and capabilities, manufacturer specifications and instructions for any attachments
- problems, and appropriate response procedures to unplanned and/or unsafe environmental conditions including:
    - wind
    - water/ice impacted ground
    - slippery surfaces
    - sun glare
- procedures for connecting battery to charger and disconnecting battery from charger and reconnecting to order picking forklift truck
- procedures for recording, reporting and maintaining workplace records and information
- risk assessment process including hierarchy of control:
    - elimination
    - substitution
    - isolation
    - engineering controls

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  - administrative controls
  - personal protective equipment (PPE)
- relevant documentation requirements
- risk control measures including barricades and traffic control
- traffic management plan procedures and requirements
- typical routine problems encountered operating an order picking forklift truck and equipment, and adjustments required for correction
- workplace procedures including work plan which may be verbal, documented/written, or electronically generated
- work area operating surface suitability including:
  - unusual and cracked surfaces
  - uneven surfaces
  - steel decks and grates
- Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislative obligations and responsibilities
- working at height procedures and relevant PPE

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

Assessment of performance must be undertaken in the workplace and/or under realistic workplace conditions.

- Simulators must not be used in the assessment of this unit of competency.

Resources for assessment must include access to:

- a suitable order picking forklift truck that complies with AS 2359 Powered industrial trucks and is in a safe/serviceable condition in accordance with manufacturer requirements
- suitable stock and compliant racking system to pick loads from
- relevant and appropriate materials, tools, equipment and personal protective equipment currently used in industry
- applicable documentation including:
  - approved codes of practice and guidance

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- relevant Australian technical standards
- manufacturer guidance material (instructions, specifications or checklists)
- relevant industry standards and operating procedures (where applicable)

Links

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TLILIC0006 Licence to operate a bridge and gantry crane

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Application

This unit specifies the skills and knowledge required to operate bridge cranes and gantry cranes safely. Competence in this unit, does not in itself result in a HRWL licence to operate this plant.

A person undertaking this unit must hold:

- a current National High-Risk Work Licence (HRWL) to perform dogging or a certification for a specific VET course for HRWL to perform dogging

Bridge crane means a crane that:

- consists of a bridge beam or beams, that are mounted to end carriages at each end, and
- can travel along elevated runways, and
- has 1 or more hoisting mechanisms arranged to traverse across the bridge.

Gantry crane means a crane that:

- consists of a bridge beam or beams supported at one or both ends by legs mounted to end carriages, and
- can travel on supporting surfaces or deck levels, whether fixed or not, and
- has a crab with 1 or more hoisting units arranged to travel across the bridge

This unit applies to the activities of a person operating bridge crane or gantry crane that is:

- controlled from a permanent cabin or control station on the crane, or
- remotely controlled and having more than 3 powered operations

A person performing this work is required to hold a bridge and gantry crane HRWL.

This unit requires a person operating a bridge crane or gantry crane to:

- plan for the work/task
- prepare for the work/task
- perform work/task
- Pack up

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit of competency. This unit is based on the licensing requirements of Part 4.5 of the Model Work Health and Safety (WHS) Regulations and meets Commonwealth, State and Territory HRWL requirements.

The National Assessment Instrument (NAI) is the mandated assessment for the HRWL to operate the relevant licencing class as detailed in this unit.

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Pre-requisite Unit

Not applicable

Competency Field

LIC - Licencing Units

Unit Sector

Not applicable

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Plan work/task	**1.1** Task requirements are identified from work orders or equivalent and a lift plan is confirmed with associated personnel and site inspection in accordance with workplace procedures
	1.2 Working area is inspected and appropriate paths for operating the bridge and gantry crane and moving/placing load/s in work area are assessed and determined in accordance with workplace procedures
	1.3 Work area operating surface is assessed to determine the quality of ground suitability for operational gantry crane in accordance workplace procedures
	1.4 Bridge and gantry crane Rated Capacity (RC) and lifting gear Working Load Limit (WLL) are established for the load/s and work/task requirements in accordance with manufacturer specifications and workplace procedures
	1.5 Relevant hazard identification and risk elimination/control measures are applied and advised to relevant person/s in accordance with workplace procedures
	1.6 Traffic management plan implementation is confirmed and followed in accordance with workplace procedures

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	1.7	Appropriate communication procedures are identified, tested with associated personnel in accordance workplace procedures
	1.8	All tasks are confirmed to ensure requirements for the relevant work area in accordance with workplace procedures
2 Prepare for work/task	**2.1**	Consultation with workplace personnel is established and maintained to ensure all crane and lifting operations are clear and consistent with site requirements in accordance with a lift plan and workplace procedures
	2.2	Risk control measures for hazards identified are checked for implementation in accordance with the lift plan and safe work procedures
	2.3	Bridge and gantry crane is accessed safely in accordance with manufacturer specifications and safe work procedures
	2.4	Pre-start bridge and gantry crane checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with safe work procedures and manufacturer specifications
	2.5	Bridge and gantry crane is set up and rigged correctly with any lifting gear as per lift plan in accordance with relevant manufacturer specifications including load chart/s and safe work procedures
	2.6	Operational checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer specifications and safe work procedures
	2.7	All controls are located, identified and tested in accordance with relevant manufacturer specifications and safe work procedures
	2.8	Crane logbook is inspected and is correct for the crane and type and required rectifications have been signed off in accordance with manufacturer requirements and safe work procedures
	2.9	Weather and work environment conditions are assessed to determine any impact on bridge and gantry crane operations in accordance with manufacturer requirements and safe work procedures

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3 Perform work/task	**3.1**	Lifts are determined within the RC of the bridge and gantry crane in accordance with load chart/s and lift plan
	3.2	Hook block is safely positioned over the load in accordance with safe work procedures and if crane is controlled from cabin following directions from associated personnel
	3.3	Lifting gear is connected to load and used safely in accordance with the lift plan and safe work procedures
	3.4	Test lift is carried out in accordance with dogging and safe work procedures
	3.5	Loads are transferred using relevant bridge and gantry crane movements and tag lines as required, in accordance with lift plan and safe work procedures
	3.6	Load and bridge and gantry crane movement is monitored constantly and operated safely in accordance with lift plan and safe work procedures
	3.7	All required communications signals are correctly interpreted and followed whilst crane is operated in accordance with safe work procedures
	3.8	Load is lowered and landed safely in accordance with lift plan and safe work procedures
	3.9	Lifting gear is disconnected from load and positioned safely and efficiently for next task in accordance with lift plan and safe work procedures
4 Pack up	**4.1**	Bridge and gantry crane is parked in accordance with manufacturer specifications and safe work procedures
	4.2	Bridge and gantry crane lifting gear and associated equipment is stowed and secured in accordance with safe work procedures
	4.3	Relevant motion locks and brakes are applied as required in accordance with manufacturer specifications and safe work procedures
	4.4	Bridge and gantry crane is shut down and secured to prevent unauthorised access/use in accordance with safe work procedures

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4.5 Post operational bridge and gantry crane checks are carried out in accordance with safe work procedures and manufacturer specifications

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non -essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to TLILIC3003 Licence to operate a bridge and gantry crane

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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Assessment Requirements for TLILIC0006 Licence to operate a bridge and gantry crane

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and include:

- applying relevant mathematical calculations in conjunction with the rated capacity to determine relevant lifting gear to perform work/task
- applying and interpreting crane manufacturer requirements and data, including load charts, to enable crane to be configured for load
- applying relevant crane movements including:
  - catching load swing appropriately
  - positioning and using lifting attachment and lifting gear to connect to load safely
  - raise and lower hoist
- applying relevant communication signals from associated personnel
- conducting and applying risk and hazard assessment strategies including:
  - confirming work area operating surface suitability based on crane and task requirements
  - travelling surfaces are clear of debris and in serviceable condition
  - overloading
  - lifting and placing of load
  - asymmetric loads
  - overhead hazards
  - restricted and poorly ventilated areas
  - risk of collision with people, moving plant and fixed structures
  - adequate lighting
  - weather conditions
- complying with Commonwealth, state and territory Work Health and Safety (WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislation and safe work procedures
- communicating with other workplace personnel through using appropriate worksite protocols including:
  - 2-way radio
  - listening
  - making and interpreting hand signals

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  - questioning to confirm understanding
  - signage
  - verbal language
  - visual aids
  - whistles
  - written instructions
- completing the pre-start check including:
  - presence of correct logbook
  - evidence of damage
  - pendant wiring not frayed or damaged (if applicable)
  - fluid leaks
  - lights work effectively
  - locating, identifying and confirming all controls
  - emergency evacuation rescue plan in place
  - mirrors and seat are adjusted appropriately
  - safety equipment checks
  - fire extinguisher
  - signage and labels to ensure they are visible and legible
  - checking for signs of paint separation and stressed welds indicating potential structural weakness
  - tyres/wheels for damage/wear and rail conditions are serviceable
  - visual damage or equipment faults
- completing operational checks ensuring:
  - all controls are located, identified and tested for functionality
  - all hydraulic functions are operated
  - Lifting gear movements and control functions are smooth and comply with operating requirements
  - hazard warning systems, safety, audible and visual warning devices including travel alarms, lights and horns are functional
  - start-up is in accordance with manufacturer requirements and workplace procedures
  - there are no unusual noises
  - long and cross travel, transmission and brake functions comply with operating requirements
- confirming and following traffic management plan procedures relevant to their role in the work area
- controlling the load and attachments including:
  - rotation of load, or magnetic or vacuum lifting attachment or grab attachment or multiple non-synchronised hoists operated simultaneously but independently
  - long and cross travel
  - positioning crane in relevant area for next task
- determining any defects or faults with operation of crane and reporting to relevant personnel

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- ensuring risk control measures within the work area are effective as per workplace procedures
- ensuring stability of load and avoidance of hazards by applying best crane practice including:
  - lifting attachment and lifting gear as low as possible
  - carrying load near to ground surface
  - accelerating and braking to minimize load swing
  - lowering load onto appropriate dunnage safely taking into consideration swing and restrictions of area
  - minimum speed
  - using handheld taglines
- following directions of dogger or rigger when load is outside vision of operator or lift plan determines it
- inputting crane configuration into crane computer (where fitted) and checking operation to accurately reflect crane configuration
- interpreting and confirming relevant documentation for the work task and relevant area
- interpreting and acting on communications signals including:
  - hoist down - hand, whistle and radio
  - hoist up - hand, whistle and radio
  - traverse (trolley) travel - hand, whistle and radio
  - long (bridge) travel - hand, whistle and radio
  - creep - hand, whistle and radio
  - stop - hand, whistle and radio
- maintaining three points of contact whilst accessing crane and ensure rungs / steps are free of hazards if applicable
- monitoring load disconnection from hook/lifting gear is safe and ensuring no movement of controls
- operating a bridge or gantry crane configured to lift and move four different loads using the main hook through an obstacle course using all crane operational controls while the load is in full view of the crane operator. Loads must consist of:
  - a load at least 10% of the Maximum Rated Capacity (MRC) of the crane, and
  - A round load with a minimum diameter of 300 mm and minimum length of 3 m that requires a dogger to sling, and
  - an asymmetrical load that requires a dogger to sling, and
  - stillage containing at least ten scaffolding standards or containing a load of steel pipes of equivalent weight that requires a dogger to sling
- positioning the crane for safe operation for:
  - application of the task
  - manoeuvring in the workplace
  - stability of the crane and the load
- recording and maintaining accurate information relating to crane operations
- reporting to relevant person/s on site risk control measures that are not in place or deficient
- setting up and validating an exclusion zone

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- shutting down a bridge and gantry crane in accordance with manufacturer requirements and workplace procedures
- test-lifting load just clear of lifting plane to allow for checks to be safely made in consultation with associated personnel to ensure:
  - slinging is correct
  - all crane equipment is functioning properly
  - load centre of gravity is correct
  - loads of unusual shape or weight distribution are correctly slung
- test-lifting load just clear of lifting plane to allow for checks of crane computer (where fitted) to ensure:
  - load measuring equipment can be used to verify calculated weight of load
  - near capacity loads do not overload crane
- using two-way radio communication during movement of load

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- appropriate workplace communication procedures including:
  - bells
  - buzzers
  - listening
  - hand signals
  - questioning techniques
  - signage
  - two-way radios
  - written instructions
  - whistles
- bridge and gantry crane characteristics and capabilities
- crane configuration mathematical calculations to:
  - estimate loads
  - relevant lifting accessories to perform work/task
- crane and lifting gear load chart/s and manufacturer requirements
- hazards including:
  - erection and pack up
  - crane stability
  - ground stability and condition including recently filled trenches and slopes
  - insufficient lighting
  - obstacles or obstruction
  - other specific hazards and dangerous materials

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    - overhead hazards including:
        - electric lines
        - service pipes
        - structures
    - traffic including pedestrians, vehicles and other plant
    - operations on unusual, uneven or difficult terrains
- lift impacting factors including:
    - centre of gravity
    - dynamic nature of load
    - flex/deflexion of load
    - length
    - weight
- manufacturer requirements and instructions on shutting down crane
- problems and application of appropriate response procedures to unplanned and/or unsafe situations and environmental conditions including:
    - wind, lightning and storms
    - failure of equipment
    - failure/loss of control including brakes
    - obstacles and obstructions
- prestart and operational checks required for a bridge and gantry crane
- relevant workplace instructions, safety information, emergency procedures
- relevant documentation requirements and procedures for recording, reporting and maintaining workplace records and information
- risk assessment management and mitigation strategies including hierarchy of control:
    - elimination
    - substitution
    - isolation
    - engineering controls
    - administrative controls
    - personal protective equipment (PPE)
- roles and responsibilities of duty holders as per legislative obligations of Work Health and Safety (WHS)/Occupational health and Safety (OHS)/Occupational Safety and Health (OSH) requirements and safe work / workplace procedures
- starting procedure of crane as per manufacturer requirements
- weather bureau forecasts and associated information and environmental conditions that could impact operation including:
    - lightning
    - rain
    - wind
    - water impacted ground
    - Ultra Violet (UV) exposure

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- workplace standards, requirements, policies and procedures for conducting operations for the bridge and gantry crane

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions

- Simulators must **not** be used in the assessment of this unit of competency.

Resources for equipment must include:

- access to a bridge and gantry crane in safe/serviceable working order and have the following characteristics:
  - appropriate bridge crane, a bridge beam mounted at each end to an end carriage, capable of travelling along elevated runways and having one or more hoisting mechanisms arranged to traverse across the bridge
  - appropriate gantry crane, a bridge beam, supported at each end by legs mounted on end carriages, capable of travelling on supported surfaces or deck levels, whether fixed or not, which has a crab with one or more hoisting units arranged to travel across the bridge
  - if remote controlled crane must have more than three powered operations that includes:
    - rotation of load, or
    - magnetic or vacuum lifting attachment, or
    - grab attachment, or
    - multiple hoists operated simultaneously but independently
- appropriate loads as outlined in the performance evidence requirements
- associated personnel to sling and direct loads including:
  - dogger or rigger
- communications equipment including:
  - bells
  - buzzers
  - two-way radios
  - whistles
- relevant personal protective equipment (PPE)
- safety devices including:

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  - audible and visual travel devices
  - horns/sirens
  - lights
- where appropriate, relevant workplace procedures and standards for operating a bridge and gantry crane including:
  - approved codes of practice and guidance
  - Australian Standards
  - checklists
  - safe work operating procedures
  - relevant industry standards (where applicable)
  - logbook
  - manufacturer guidelines (instructions, specifications or checklists)
  - relevant workplace documentation

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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TLILIC0008 Licence to operate a non-slewing mobile crane (greater than 3 tonnes capacity)

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Application

This unit specifies the skills and knowledge required to operate a non-slewing mobile crane with a Maximum Rated Capacity (MRC) exceeding 3 tonnes safely, in accordance with all relevant legislative responsibilities. Competence in this unit, does not in itself result in a HRWL licence to operate this plant.

A person undertaking this unit must hold:

- a current National High-Risk Work Licence (HRWL) or a certification for a specific VET course for HRWL to perform dogging

Non-slewing mobile crane means a mobile crane incorporating a boom or jib that cannot be slewed, and includes:

- an articulated mobile crane
- a locomotive crane
- but does not include vehicle tow trucks.

A person performing this work is required to hold a non-slewing mobile crane HRWL.

This unit requires a person operating non-slewing mobile crane with an MRC exceeding 3 tonnes to:

- plan the work/task
- prepare for the work/task
- perform work/task
- pack up

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit of competency. This unit is based on the licensing requirements of Part 4.5 of the Model Work Health and Safety (WHS) Regulations and meets Commonwealth, State and Territory HRWL requirements.

The National Assessment Instrument (NAI) is the mandated assessment for the HRWL to operate the relevant licencing class as detailed in this unit.

Pre-requisite Unit

Not applicable

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Competency Field

LIC - Licencing Units

Unit Sector

Not applicable

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Plan work/task	**1.1** Task requirements are identified from work orders or equivalent and a lift plan is confirmed with associated personnel and a site inspection is conducted in accordance with workplace procedures
	1.2 Work area operating surface is confirmed to determine the quality of ground suitability for operational use of non-slewing mobile crane in accordance with workplace procedures
	1.3 Non-slewing mobile crane rated capacity (RC) and the lifting gear Working Load Limit (WLL) are established for the load/s and work/task requirements in accordance with manufacturer requirements and workplace procedures
	1.4 Appropriate paths for operating the mobile crane and moving and placing load/s in work area are assessed and determined in accordance with workplace procedures
	1.5 Relevant hazard identification and risk elimination/control measures are applied and advised to associated personnel in accordance with workplace procedures
	1.6 Traffic management plan implementation is confirmed and followed in accordance with workplace procedures
	1.7 Appropriate communication procedures are identified and tested with associated personnel in accordance with workplace procedures

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	1.8	All tasks are confirmed to ensure requirements for the relevant work area in accordance with a lift plan and workplace procedures
2 Prepare for work/task	**2.1**	Consultation with workplace personnel is established and maintained to ensure lift plan is clear and consistent with site requirements in accordance with a lift plan and workplace procedures
	2.2	Risk control measures for hazards identified are checked for implementation in accordance with the lift plan and safe work procedures
	2.3	Non-slewing mobile crane is accessed safely in accordance with manufacturer requirements and safe work procedures
	2.4	Pre-start crane checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer requirements and safe work procedures
	2.5	Mobile crane is set up correctly with any lifting gear as per the lift plan in accordance with relevant manufacturer requirements including load chart/s and safe work procedures
	2.6	Fly jib (if fitted) is set up as required in accordance with specific manufacturer requirements and safe work procedures
	2.7	Operational checks are carried out and any damage and defects are reported, recorded and appropriate action is taken in accordance with manufacturer requirements and safe work procedures
	2.8	Crane logbook is checked to confirm current compliance, is correct for the crane type, is completed and signed and required rectifications have been signed off in accordance with manufacturer requirements and safe work procedures
	2.9	Weather and work environment conditions are assessed to determine any impact on mobile crane operations in accordance with manufacturer requirements and safe work procedures
3 Perform work/task	**3.1**	Lifts are determined within the RC of the non slewing mobile crane in accordance with the load chart/s and lift

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		plan
	3.2	Boom/jib and hook block is safely positioned over the load following directions from associated personnel in accordance with the lift plan and safe work procedures
	3.3	Lifting gear where required is connected to the load and used safely in accordance with the lift plan, safe work procedures and manufacturer requirements
	3.4	Test lift is carried out in accordance with dogging and safe work procedures
	3.5	Loads are transferred using relevant crane movements and tag lines as required, in accordance with lift plan and safe work procedures
	3.6	Load and crane movement is monitored constantly and crane is operated safely in accordance with lift plan and safe work procedures
	3.7	All required communication signals are correctly interpreted and followed whilst crane is operated in accordance with the lift plan and safe work procedures
	3.8	Load is lowered and landed safely in accordance with lift plan and safe work procedures
	3.9	Lifting gear is disconnected from load and crane is positioned safely and efficiently for next task in accordance with lift plan and safe work procedures
4 Pack Up	**4.1**	Crane boom/jib, lifting gear and associated equipment is stowed and secured as required in accordance with manufacturer requirements and safe work procedures
	4.2	Relevant motion locks and brakes are applied as required in accordance with manufacturer requirements and safe work procedures
	4.3	Crane is shut down and secured to prevent unauthorised access/use in accordance with safe work procedures
	4.4	Post-operational crane checks are carried out in accordance with legislative responsibilities, safe work procedures and manufacturer requirements

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Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non -essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to TLILIC3006 Licence to operate a non-slewing mobile crane (greater than 3 tonnes)

Links

Companion Volume Implementation Guide - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=df441c6e-213d-43e3-874c-0b3f7036d851

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Assessment Requirements for TLILIC0008 Licence to operate a non-slewing mobile crane (greater than 3 tonnes capacity)

Modification History

Release 1. This is the first release of this unit of competency in the TLI Transport and Logistics Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and include:

- applying relevant mathematical calculations in conjunction with lift plan and load chart, radius requirements and relevant lifting gear to perform work/task to enable crane to be configured for load including:
  - boom
  - fly-jib (where fitted)
  - line pull
  - mobiling
  - type of hook
  - side slope derations
  - articulation derations
- applying relevant crane movements including:
  - boom/jib up and down (luffing)
  - positioning and using main and auxiliary hook and lifting gear to connect to load safely
  - raise and lower hoist
  - telescope in and out
  - travel and articulating (as required)
- communicating with other workplace personnel through using appropriate worksite procedures including:
  - 2-way radio
  - listening
  - making and interpreting hand signals
  - questioning to confirm understanding
  - signage
  - verbal language
  - visual aids
  - whistles
  - written instructions
- complying with Commonwealth, state and territory Work Health and Safety

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(WHS)/Occupational Health and Safety (OHS)/Occupational Safety and Health (OSH) legislation and safe work procedures

- completing the pre-start check including:
  - battery power level as required by manufacturer requirements
  - engine / mechanical fluid level checks as required by manufacturer requirements
  - presence of correct logbook
  - evidence of damage
  - fluid leaks
  - lights work effectively
  - locating, identifying and confirming all controls
  - mirrors and seat are adjusted appropriately
  - safety equipment checks
  - signage and labels to ensure they are visible and legible
  - checking for signs of paint separation and stressed welds indicating potential structural weakness
  - tyres and wheels for damage/wear and correct inflation (Water/Air)
  - updating records as required
  - visual damage or equipment faults
- conducting and applying risk and hazard strategies including:
  - confirming work area operating surface suitability based on crane and task requirements
  - articulation of crane
  - dynamic loads
  - ground conditions including surface and slopes
  - impact of tyre inflation/condition
  - load swing
  - overloading
  - pick and placement of load
  - asymmetric loads
  - overhead hazards
  - restricted site/s and poorly ventilated area/s
  - risk of collision with people, moving plant and fixed structures
  - adequate lighting
  - weather conditions
- completing operational checks ensuring:
  - all controls are located, identified and tested for functionality
  - all hydraulic functions are operated
  - lifting gear movements and control functions are smooth and comply with lift plan
  - hazard warning systems, safety, audible and visual warning devices are checked to ensure they are functional including:
    - reversing beepers

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    - lights
    - horns
    - crane computer alarm (where fitted)
    - anti-two block alarms (where fitted)
  - start-up is in accordance with manufacturer requirements and workplace procedures
  - there are no unusual noises
  - steering, transmission and brake functions comply with operating requirements
- confirming and following traffic management plan procedures relevant to crane operator role in the work area
- determining any defects or faults with operation of crane and reporting to relevant person/s
- ensuring risk control measures within the work area are effective as per workplace procedures
- ensuring stability of load and avoidance of hazards by applying best mobile practice including:
  - allowing for boom deflection
  - boom/jib as low as possible
  - boom/jib in line with crane
  - carrying load near to ground surface
  - crane stability whilst manoeuvring load into position with drive/steering wheels and articulating as required
  - gently accelerating and braking to minimise load swing
  - lowering load safely and stably onto appropriate dunnage taking into consideration swing and restrictions of area
  - minimum boom/jib length
  - minimum speed
  - using handheld taglines/bridling
- following directions of dogger or rigger
- interpreting and confirming relevant documentation for the work task and relevant area
- inputting crane configuration into crane computer (where fitted) and checking operation to accurately reflect crane configuration
- interpreting and acting on communications signals including:
  - hoist down - hand and whistle and radio
  - hoist up - hand and whistle and radio
  - luff boom down - hand and whistle and radio
  - luff boom up - hand and whistle and radio
  - articulate left - hand and whistle and radio
  - articulate right - hand and whistle and radio
  - stop - hand and whistle and radio
  - telescope in - hand and whistle and 2-way radio (where manufacturer requirements allow)
  - telescope out - hand and whistle and 2-way radio (where manufacturer requirements allow)

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  - travel - hand and radio
- maintaining three points of contact whilst accessing crane and ensure rungs / steps are free of hazards
- monitoring load disconnection from hook is safe and ensuring no movement of controls
- observing relevant communication signals from relevant person
- operating an articulated non-slewing mobile crane with a rated capacity (RC) of 12 tonnes or greater to lift four different loads using the main hook through an obstacle course using all crane operational controls while the load is in full view of the crane operator. Loads must consist of:
  - a load of >50% of the Rated Capacity (RC) of the crane with a boom length of >75%, and
  - a round load with a minimum diameter of 300 mm and minimum length of 3 m that requires a dogger to sling, and
  - an asymmetrical load that requires a dogger to sling, and
  - travelling with a load of stillage containing at least ten scaffolding standards or containing a load of steel pipes of equivalent weight that requires a dogger to sling and a boom length of <75%
- positioning the non-slewing mobile crane for safe operation for:
  - application of the task
  - manoeuvring in the workplace
  - aligning of crane boom to the load
  - stability of the non-slewing mobile crane and the load whilst driving to load set down position
- recording and maintaining accurate information relating to crane operations
- reporting to relevant person/s on site risk control measures that are not in place or deficient
- setting up of:
  - fly jib (where fitted)
  - manual boom section (where fitted)
- setting up and validating an exclusion zone
- shutting down a non-slewing mobile crane in accordance with manufacturer requirements and workplace procedures
- stabilising a non-slewing mobile crane for operation by ensuring level and articulation (if required) is checked and within deration load chart requirements
- test-lifting load just clear of lifting plane to allow for checks to be safely made in consultation with associated personnel to ensure:
  - slinging is correct
  - all crane equipment is functioning properly
  - load centre of gravity is correct
  - loads of unusual shape or weight distribution are correctly slung
- test-lifting load just clear of lifting plane to allow for checks of crane computer (where fitted) to ensure:
  - load measuring equipment can be used to verify calculated weight of load
  - near capacity loads do not overload crane

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Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- appropriate worksite communication procedures including:
  - listening
  - hand signals
  - questioning techniques
  - signage
  - two-way radios
  - written instructions
  - whistles
- crane configuration mathematical calculations to:
  - estimate loads
  - establish counterweight/s requirements (where fitted)
  - radius requirements
  - relevant lifting gear to perform work/task
- characteristics and impact of factors affecting non-slewing mobile crane stability whilst mobiling loads including:
  - side slope derations
  - articulation derations of crane
  - correct tyre pressure (inflation/condition)
  - driving safely on roadways
  - pick up and carry the load
- crane and lifting gear load chart/s and manufacturer requirements
- lift impacting factors including:
  - centre of gravity
  - dynamic nature of load
  - deflection of boom
  - length
  - radius of lift
  - weight
  - side slope derations
  - articulation derations of crane
  - tyre inflation pressures
- hazards including:
  - pack up and crane stability, crane tipping and demolition sites
  - ground stability including ground condition, recently filled trenches and slopes
  - insufficient lighting
  - obstacles or obstruction

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  - catching load swing appropriately
  - other specific hazards and dangerous materials
  - overhead hazards including:
    - electric lines
    - service pipes
    - fixed structures
    - Vegetation (Trees)
  - traffic including pedestrians, vehicles and other plant
  - operations on unusual, uneven or difficult terrains
- impact of factors affecting non-slewing mobile crane stability including:
  - overloading
  - pick up and placement of load
  - unbalanced loads
  - articulation of crane
  - correct tyre pressures (inflation/condition)
  - side slope derations
- manufacturer requirements and instructions on shutting down and packing up crane
- mobile non-slewing crane characteristics and capabilities to allow crane configuration to suit a range of loads
- relevant workplace instructions, safety information, emergency procedures
- relevant documentation requirements and procedures for recording, reporting and maintaining workplace records and information
- risk assessment management and mitigation strategies including hierarchy of control:
  - elimination
  - substitution
  - isolation
  - engineering controls
  - administrative controls
  - personal protective equipment (PPE)
- roles and responsibilities of duty holders as per legislative obligations of Work Health and Safety (WHS)/Occupational health and Safety (OHS)/Occupational Safety and Health (OSH) requirements and safe work/workplace procedures
- prestart and operational checks required for a non-slewing mobile crane
- starting procedure of crane as per manufacturer requirements
- set up of:
  - jib
  - fly jib (where fitted)
  - manual boom section (where fitted)
- weather bureau forecasts and environmental conditions that could impact operation
- workplace standards, requirements, policies and procedures for conducting operations for the mobile non-slewing crane

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- problems and applying appropriate response procedures to unplanned and/or unsafe situations and environmental conditions
- work area suitability based on relevant ground reports including:
  - backfilled ground
  - bitumen
  - concrete
  - hard compacted soil
  - pre-contaminated soils
  - rock
  - rough uneven ground
  - soft soils

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

- Simulators must not be used in the assessment of this unit of competency.

Resources for assessment must include access to:

- non-slewing articulated mobile crane with an MRC greater than 12 tonnes in safe/serviceable working order in accordance with manufacturer specifications
- appropriate loads as outlined in the performance evidence requirements
- associated personnel to sling and direct loads including:
  - dogger or rigger
- communications equipment including:
  - two-way radios
  - whistles
- personal protective equipment (PPE)
- relevant documentation for operating a non-slewing mobile crane over 3 tonnes including:
  - approved codes of practice and guidance
  - Australian Standards
  - checklists

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- industry operating procedures
- relevant industry standards (where applicable)
- logbook
- manufacturer guidelines (instructions, specifications or checklists)

Links

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UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit specifies the mandatory requirements of occupational health and safety and how they apply to the various electrotechnology work functions. It encompasses responsibilities for health and safety, risk management processes at all operative levels and adherence to safety practices as part of the normal way of doing work.

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

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Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) **Competencies**

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

This unit addresses information, processes and techniques for the application of general occupational health and safety requirements in workplaces and is essential for employees without managerial or supervisory responsibilities

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to enter a	1.1 Work area access permits are obtained from appropriate personnel according to established

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ELEMENT	PERFORMANCE CRITERIA	
work area		procedures
	1.2	Safe work methods for controlling risk obtained, read and understood prior to undertaking a work activity.
	1.3.	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.
	1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.
2 Apply safe working practices.	2.1	Safe work methods for controlling risk are followed accurately.
	2.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.
3. Follow workplace procedures for hazard identification and risk control	3.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
	3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
	3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
	3.4	Workplace instructions and training are followed accurately within established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying OHS practices in the workplace.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE101A Occupational Health and Safety principles

Evidence shall show an understanding of Occupational Health and Safety to an extent indicated by the following aspects

T1 The basic legal requirements covering occupational health and safety in the workplace encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T2 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- Importance of safe premises, buildings and security in an industrial setting and the consequences of non- compliance.
- standard work procedure.

T3 Manual Handling encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries

T4 Chemicals in the workplace encompassing:

- hazardous substances and dangerous goods.
- classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose and interpretation of material safety data sheet (MSDS)

T5 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T6 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T7 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, how it occurs and means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T8 Working safely with electricity encompassing:

- effects of electric shock on the human body

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REQUIRED SKILLS AND KNOWLEDGE

- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T9 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1**) Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over

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EVIDENCE GUIDE

time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able

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EVIDENCE GUIDE

to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement encompassing:
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Applying OHS practices in the workplace as described in 8) and including:

A Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.

B Understanding and following risk control safe work methods.

C Applying work procedures and instructions as they apply to risk control measures.

D Dealing with accidents and emergencies within the scope of responsibility.

E Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

F Dealing with unplanned events

Note:
Ability to implement these Occupation Health and Safety

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EVIDENCE GUIDE

measures shall be demonstrated on all occasions safety issues arise.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying OHS practices in the workplace.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or qualification.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to each of the following

- Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards present in the industry and particular workplace
- Accepted industry work procedures and the specific safety procedures and work instructions for particular workplace.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field 5)

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Competency Field 5)

Electrotechnology

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UEENEEE104A Solve problems in d.c. circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers determining correct operation of single source d.c. series, parallel and series-parallel circuits and providing solutions as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in single and multiple path circuits.

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

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Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe
the essential outcomes

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of a unit of competency

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to work on d.c. electrical circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control work preparation measures and procedures are followed.
		1.3	The nature of the circuit problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve d.c. circuit problems.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methodological techniques are used to solve d.c. circuit problems from measure and calculated values as they apply to electrical circuit.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without damage to apparatus,

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ELEMENT	PERFORMANCE CRITERIA	
		circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in d.c. circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE104A Direct current circuits

Evidence shall show an understanding of electrical fundamentals and direct current multiple path circuits to an extent indicated by the following aspects:

T1 Basic electrical concepts encompassing:

- electrotechnology industry
- static and current electricity
- production of electricity by renewable and non renewable energy sources
- transportation of electricity from the source to the load via the transmission and distribution systems
- utilisation of electricity by the various loads
- basic calculations involving quantity of electricity, velocity and speed with relationship to the generation and transportation of electricity.

T2 Basic electrical circuit encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram
- purpose of each component in the circuit
- effects of an open-circuit, a closed-circuit and a short-circuit
- multiple and sub-multiple units

T3 Ohm's Law encompassing:

- basic d.c. single path circuit.
- voltage and currents levels in a basic d.c. single path circuit.
- effects of an open-circuit, a closed-circuit and a short-circuit on a basic d.c. single path relationship between voltage and current from measured values in a simple circuit
- determining voltage, current and resistance in a circuit given any two of these quantities
- graphical relationships of voltage, current and resistance
- relationship between voltage, current and resistance

T4 Electrical power encompassing:

- relationship between force, power, work and energy
- power dissipated in circuit from voltage, current and resistance values
- power ratings of devices
- measurement electrical power in a d.c. circuit
- effects of power rating of various resistors

T5 Effects of electrical current encompassing:

- physiological effects of current and the fundamental principles (listed in AS/NZS 3000) for protection against the this effect
- basic principles by which electric current can result in the production of heat; the production of magnetic fields; a chemical reaction
- typical uses of the effects of current
- mechanisms by which metals corrode
- fundamental principles (listed in AS/NZS3000) for protection against the damaging effects of current

T6 EMF sources energy sources and conversion electrical energy encompassing:

- basic principles of producing a emf from the interaction of a moving conductor in a magnetic field.
- basic principles of producing an emf from the heating of one junction of a thermocouple.
- basic principles of producing a emf by the application of sun light falling on the surface of photovoltaic cells
- basic principles of generating a emf when a mechanical force is applied to a crystal (piezo electric effect)
- principles of producing a electrical current from primary, secondary and fuel cells

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REQUIRED SKILLS AND KNOWLEDGE

- input, output, efficiency or losses of electrical systems and machines
- effect of losses in electrical wiring and machines
- principle of conservation of energy

T7 Resistors encompassing:

- features of fixed and variable resistor types and typical applications
- identification of fixed and variable resistors
- various types of fixed resistors used in the Electro technology Industry. e.g. wire-wound, carbon film, tapped resistors.
- various types of variable resistors used in the Electro technology Industry e.g. adjustable resistors: potentiometer and rheostat; light dependent resistor (LDR); voltage dependent resistor (VDR) and temperature dependent resistor (NTC, PTC).
- characteristics of temperature, voltage and light dependent resistors and typical applications of each
- power ratings of a resistor.
- power loss (heat) occurring in a conductor.
- resistance of a colour coded resistor from colour code tables and confirm the value by measurement.
- measurement of resistance of a range of variable' resistors under varying conditions of light, voltage, temperature conditions.
- specifying a resistor for a particular application.

T8 Series circuits encompassing:

- circuit diagram of a single-source d.c. 'series' circuit.
- Identification of the major components of a 'series' circuit: power supply; loads; connecting leads and switch
- applications where 'series' circuits are used in the Electro technology industry.
- characteristics of a 'series' circuit - connection of loads, current path, voltage drops, power dissipation and affects of an open circuit in a 'series' circuit.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities
- relationship between voltage drops and resistance in a simple voltage divider network.
- setting up and connecting a single-source series dc circuit
- measurement of resistance, voltage and current values in a single source series circuit
- effect of an open-circuit on a series connected circuit

T9 Parallel circuits encompassing:

- schematic diagram of a single-source d.c. 'parallel' circuit.
- major components of a 'parallel' circuit (power supply, loads, connecting leads and switch)
- applications where 'parallel' circuits are used in the Electrotechnology industry.

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REQUIRED SKILLS AND KNOWLEDGE

- characteristics of a 'parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'parallel' circuit).
- relationship between currents entering a junction and currents leaving a junction
- relationship between branch currents and resistances in a two branch current divider network.
- calculation of the total resistance of a 'parallel' circuit.
- calculation of the total current of a 'parallel' circuit.
- Calculation of the total voltage and the individual voltage drops of a 'parallel' circuit.
- setting up and connecting a single-source d.c. parallel circuit
- resistance, voltage and current measurements in a single-source parallel circuit
- voltage, current, resistance or power dissipated from measured values of any of these quantities
- output current and voltage levels of connecting cells in parallel.

T10 Series/parallel circuits encompassing:

- schematic diagram of a single-source d.c. 'series/parallel' circuit.
- major components of a 'series/parallel' circuit (power supply, loads, connecting leads and switch)
- applications where 'series/parallel' circuits are used in the Electrotechnology industry.
- characteristics of a 'series/parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'series/parallel' circuit).
- relationship between voltages, currents and resistances in a bridge network.
- calculation of the total resistance of a 'series/parallel' circuit.
- calculation of the total current of a 'series/parallel' circuit.
- calculation of the total voltage and the individual voltage drops of a 'series/parallel' circuit.
- setting up and connecting a single-source d.c. series/ parallel circuit
- resistance, voltage and current measurements in a single-source d.c. series / parallel circuit
- the voltage, current, resistances or power dissipated from measured values of any two of these quantities

T11 Factors affecting resistance encompassing:

- four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature)
- affect the change in the type of material (resistivity) has on the resistance of a conductor.
- affect the change in 'length' has on the resistance of a conductor.
- affect the change in 'cross-sectional area' has on the resistance of a conductor.
- effects of temperature change on the resistance of various conducting materials
- effects of resistance on the current-carrying capacity and voltage drop in cables.

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REQUIRED SKILLS AND KNOWLEDGE

- calculation of the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature
- using digital and analogue ohmmeter to measure the change in resistance of different types of conductive materials (copper, aluminium, nichrome, tungsten) when those materials undergo a change in type of material length, cross-sectional area and temperature.

T12 Effects of meters in a circuit encompassing:

- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application.
- measuring resistance using direct, volt-ammeter and bridge methods.
- instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used.
- hazards involved in using electrical instruments and the safety control measures that should be taken.
- operating characteristics of analogue and digital meters.
- correct techniques to read the scale of an analogue meters and how to reduce the 'parallax' error.
- types of voltmeters used in the Electrotechnology industry – bench type, clamp meter, Multimeter, etc.
- purpose and characteristics (internal resistance, range, loading effect and accuracy) of a voltmeter.
- types of voltage indicator testers. e.g. LED, neon, solenoid, volt-stick, series tester, etc. and explain the purpose of each voltage indicator tester.
- operation of various voltage indicator testers.
- advantages and disadvantages of each voltage indicator tester.
- various types of ammeters used in the Electrotechnology industry – bench, clamp meter, multimeter, etc.
- purpose of an ammeter and the correct connection (series) of an ammeter into a circuit.
- reasons why the internal resistance of an ammeter must be extremely low and the dangers and consequences of connecting an ammeter in parallel and/or wrong polarity.
- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application
- connecting an analogue/digital voltmeter into a circuit ensuring the polarities are correct and take various voltage readings.
- loading effect of various voltmeters when measuring voltage across various loads.
- using voltage indicator testers to detect the presence of various voltage levels.
- connecting analogue/digital ammeter into a circuit ensuring the polarities are correct and take various current readings.

T13 Resistance measurement encompassing:

- Identification of instruments used in the field to measure resistance (including

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REQUIRED SKILLS AND KNOWLEDGE

insulation resistance) and the typical circumstances in which they are used.

- the purpose of an Insulation Resistance (IR) Tester.
- the parts and functions of various analogue and digital IR Tester (selector range switch, zero ohms adjustment, battery check function, scale and connecting leads).
- reasons why the supply must be isolated prior to using the IR tester.
- where and why the continuity test would be used in an electrical installation.
- where and why the insulation resistance test would be used in an electrical installation.
- the voltage ranges of an IR tester and where each range may be used. e.g. 250 V d.c, 500 V d.c and 1000 V d.c
- AS/NZS3000 Wiring Rules requirements – continuity test and insulation resistance (IR) test.
- purpose of regular IR tester calibration.
- the correct methods of storing the IR tester after use
- carry out a calibration check on a IR Tester
- measurement of low values of resistance using an IR tester continuity functions.
- measurement of high values of resistance using an IR tester insulation resistance function.
- volt-ammeter (short shunt and long shunt) methods of measuring resistance.
- calculation of resistance values using voltmeter and ammeter reading (long and short shunt connections)
- measurement of resistance using volt-ammeter methods

T14 Capacitors and Capacitance encompassing:

- basic construction of standard capacitor, highlighting the: plates, dielectric and connecting leads
- different types of dielectric material and each dielectric's relative permittivity.
- identification of various types of capacitors commonly used in the Electrotechnology industry (fixed value capacitors -stacked plate, rolled, electrolytic, ceramic, mica and Variable value capacitors – tuning and trimmer)
- circuit symbol of various types of capacitors: standard; variable, trimmer and polarised
- terms: Capacitance (C), Electric charge (Q) and Energy (W)
- unit of: Capacitance (Farad), Electric charge (Coulomb) and Energy (Joule)
- factors affecting capacitance (the effective area of the plates, the distance between the plates and the type of dielectric) and explain how these factors are present in all circuits to some extent.
- how a capacitor is charged in a d.c. circuit.
- behaviour of a series d.c. circuit containing resistance and capacitance components. - charge and discharge curves
- the term 'Time Constant' and its relationship to the charging and discharging of a capacitor.
- calculation of quantities from given information: Capacitance (Q = VC); Energy (W

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REQUIRED SKILLS AND KNOWLEDGE

=½CV2); Voltage (V = Q/C)

- calculation one time constant as well as the time taken to fully charge and discharge a given capacitor. ($\tau = RC$)
- connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit

T15 Capacitors in Series and Parallel encompassing:

- hazards involved in working with capacitance effects and the safety control measures that should be taken.
- safe handling and the correct methods of discharging various size capacitors
- dangers of a charged capacitor and the consequences of discharging a capacitor through a person
- factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent.
- effects of capacitors connected in parallel by calculating their equivalent capacitance.
- effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance.
- Connecting capacitors in series and/or parallel configurations to achieve various capacitance values.
- common faults in capacitors.
- testing of capacitors to determine serviceability.
- application of capacitors in the Electrotechnology industry.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for

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apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solving problems in d.c. circuits as described in 8) and including:

    A Using methodological techniques to solve d.c. circuit problems from measure and calculated values

    B Determining the operating parameters of an existing circuit.

    C Altering an existing circuit to comply with specified operating parameters.

    D Developing circuits to comply with a specified function and operating parameters.

    E Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the

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	approved industry simulation policy. The resources used for assessment should reflect current industry practices in relation to solving problems in d.c. circuits.
Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to single source series, parallel and series-parallel d.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions and at least two of the following types of circuit problems and on more than one occasions:

- Determining the operating parameters of an existing circuit
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrotechnology

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UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers the use of drawings, diagrams, cable schedules, standards, codes and specifications as they apply to the various electrotechnology work functions. It encompasses the rudiments for communicating with schematic, wiring and mechanical diagrams and equipment and cable/connection schedules, manuals, site and architectural drawings and plans showing the location of services, apparatus, plant and machinery and understanding the use and format of compliance standards and job specifications.

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

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Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to use drawings, diagrams, schedules and manuals.	1.1	Established OHS risk control measures and procedures are followed.
		1.2	The need for drawings, diagrams, schedules or manuals is determined from the nature of the work to be undertaken.
		1.3	Established routines and procedures are followed to obtain drawings, diagrams, schedules or manuals required for the work to be undertaken.
2	Use drawings, diagrams, schedules and manuals to obtain job information.	2.1	Drawings, diagrams, schedules and/or manuals are selected, appropriate to the work being undertaken.
		2.2	Drawings, diagrams and schedules are interpreted using knowledge of drawing layouts, conventions and symbols.
		2.3	Dimensions are extracted from drawings and diagrams for application to work undertaken.
		2.4	Location of equipment is determined from equipment schedules and location diagrams.
		2.5	Manuals are reviewed to ascertain their format and where information relevant to the work to be undertaken is located.
		2.6	Information given in manuals is interpreted in relation to the work to be undertaken.
3	Use drawings, diagrams, schedules and manuals to	3.1	Drawing conventions are used in neat freehand drawings to convey information and ideas to others involved in the work to be undertaken.

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ELEMENT	PERFORMANCE CRITERIA	
convey information and ideas.	3.2	Drawing conventions are used to neatly correct freehand original job drawing to show final 'as-installed' arrangement.
	3.3	Corrected drawings are forwarded to appropriate person(s) in accordance with established procedures.
4 Prepare to use compliance standards, codes and specifications.	4.1	Compliance Standards and Codes that apply to particular disciplines are sought and obtained.
	4.2	The format of compliance Standards and Codes that apply to particular disciplines are reviewed and understood.
	4.3	The purpose and format and typical content of job specifications are reviewed and understood.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using drawings, diagrams, cable schedules, standards, codes and specifications.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE107A Drawings, diagrams and schedules

Evidence shall show an understanding of drawings, diagrams and schedules used in electrotechnology work to an extent indicated by the following aspects:

T1 Architectural drawings encompassing:

- site plans, floor plans detailed drawings and standard drawings
- architectural floor plan to determine the power and lighting or communications / audio/ video layouts required in a domestic installation
- site plan to locate the service point, consumers mains, communication services, main switchboard, distribution boards and/or builders supplies.
- standard drawing scales to determine the actual lengths represented by dimensions on an architectural drawing.
- reading and interpretation of floor plans to determine the location of the electrical/

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REQUIRED SKILLS AND KNOWLEDGE

communication/audio accessories and appliances.

- Australian standard symbols used on floor plans to show the location of the accessories and appliances as detailed in an electrical schedule.

T2 Electrical drawings encompassing:

- types of electrical drawings: block, circuit, wiring and ladder diagrams
- purpose and application of block, circuit, wiring diagrams and ladder diagrams
- Australian standard symbols used to represent components on electrical diagrams.
- conventions used in and the features of circuit diagrams
- converting a circuit diagram to a wiring diagram
- identification of cable type, origin and route from a cable schedule.
- developing a cable schedule for a given installation.

T3 Circuit diagrams encompassing:

- purpose of circuit diagrams in the electrotechnology industry
- conventions used in and the features of circuit diagrams
- sketching basic circuit diagrams
- common symbols used in circuit diagram (Australian Drawing Standard AS/NZS 1102)
- developing switching charts to identify the terminals of various types of switches
- connecting equipment using circuit diagrams.

T4 Wiring diagrams encompassing:

- purpose of wiring diagrams in the electrotechnology industry
- conventions used in and the features of wiring diagrams
- sketching basic wiring diagrams
- common symbols used in wiring diagram (Australian Drawing Standard AS/NZS 1102)
- connecting equipment using wiring diagrams.

T5 Building construction drawings and diagrams encompassing:

- building types: timber frame, brick veneer, double brick and metal frame.
- identification of different types of: footings, floors, external walls, roofs, interior walls
- typical cable routes through buildings, structures and premises
- sequence of each constructional stage for brick, brick veneer and timber cottages
- identification of the stages at which the electrical/communications - first and second fixing occurs in the constructional sequence
- areas of cooperation between electrical/communications and other building trades

KS02-EE107A Introduction to regulations, compliance standards and codes

Evidence shall show an understanding of regulations, compliance standards and codes that apply to electrical work to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Regulation for undertaking electrical work encompassing:

- scope of work covered by licensing in the electrotechnology industry (Electrical licensing)
- legislative requirements for ensuring electrical or electronic equipment is safe i.e. compliance requirements of electrical installations

T2 Standards philosophy and format encompassing:

- performance verses prescriptive requirements
- purpose of technical standards and their development
- role of standards Australia/New Zealand, International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC)
- how standards are used in compulsory and accreditation compliance schemes.
- arrangement and use of technical standards in relation to electrical and electronic work
- how to read and apply a standard.
- Standards and codes that apply to all types of electrical installations
- Standards include Standards mandated under regulation (e.g. Wiring Rules) or by an authority, deemed-to-comply standard and local service requirements (e.g. Service rules).
- Codes include those applicable to electrical safe working practices and some aspects of the Building Code of Australia.

T3 Purpose, format and content of typical job specifications encompassing:

- NATSPEC specification system - provide the most common templates on which job specification are written.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1**) Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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EVIDENCE GUIDE

intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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EVIDENCE GUIDE

specified in the performance criteria and range statement

- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use drawings, diagrams, schedules, standards, codes and specifications as described in 8) Range and including:

    A Identifying drawings, diagrams, schedules and manuals relevant to the work to be undertaken.

    B Interpreting drawings, diagrams, schedules and manuals correctly.

    C Using correct conventions in freehand drawings.

    D Giving correct information in freehand drawings.

    E Obtaining compliance Standards and Codes applicable to particular disciplines

    F Reviewing and understanding the format of compliance Standards and Codes that apply to particular disciplines

    G Reviewing the format and content of typical job specifications.

    H Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment

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EVIDENCE GUIDE

	environment. Note: Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy. The resources used for assessment should reflect current industry practices in relation to using drawings, diagrams, schedules and manuals.
Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the use of drawings, diagrams, schedules, standards, codes or specifications is required.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembly, installation, fault finding, maintenance or development work functions in any of the following disciplines:

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RANGE STATEMENT

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEG101A Solve problems in electromagnetic devices and related circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of electromagnetic devices and related circuits and providing solutions as they apply to electrical installations and equipment. It encompasses working safely, power circuit problems solving processes, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in electromagnetic devices and related circuits.

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) **License to practice**

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

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Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Elements and Performance Criteria Pre-Content

6) Elements describe
the essential outcomes
of a unit of competency

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to work on electromagnetic devices and circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control work preparation measures and procedures are followed.
		1.3	The nature of the device(s)/circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve electromagnetic devices/circuit problems.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solving circuit problems from measure and calculated values as they apply to electromagnetic devices/circuits.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electromagnetic devices and related circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG101A Electromagnetic devices and circuits

Evidence shall show an understanding of electromagnetic devices and circuits to an extent indicated by the following aspects:

T1 Magnetism encompassing:

- magnetic field pattern of bar and horse-shoe magnets.
- magnets attraction and repulsion when brought in contact with each other.
- common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials).
- principle of magnetic screening (shielding) and its applications.
- practical applications of magnets

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REQUIRED SKILLS AND KNOWLEDGE

- construction, operation and applications of reed switches.

T2 Electromagnetism encompassing:

- conventions representing direction of current flow in a conductor.
- magnetic field pattern around a single conductor and two adjacent conductors carrying current.
- Using the “right hand rule” to determine the direction of magnetic field around a current carrying conductor.
- direction of force between adjacent current carrying conductors.
- effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions).
- magnetic field around an electromagnet.
- Using the “right hand rule” to determine the direction of magnetic field around a current carrying coil.
- magnetomotive force (m.m.f.) and its relationship to the number of turns in a coil and the current flowing in the coil.
- practical applications of electromagnets.

T3 Magnetic circuits encompassing:

- magnetic characteristic curve for various materials and identify the various regions.
- Identify the various conditions of a magnetic material from its Hysteresis loop.
- factors which determine losses in magnetic material.
- methods used to reduce electrical losses in a magnetic circuit.
- magnetic flux (definition, unit and symbol).
- reluctance as the opposition to the establishment of magnetic flux.
- permeability (definition, symbol and unit).
- difference for magnetic and non-magnetic materials in regards to reluctance and permeability.
- calculation of m.m.f., flux or reluctance given any two values.
- flux density (definition, symbol, unit and calculation).
- magnetising force (definition, symbol, unit and calculation).
- common magnetic circuit types.
- effect of an air gap in a magnetic circuit.
- terms “magnetic leakage” and “magnetic fringing”.

T4 Electromagnetic induction encompassing:

- principle of electromagnetic induction (Faraday’s law of electromagnetic induction).
- applying “Fleming’s right hand rule” to a current a carrying conductor under the influence of a magnetic field.
- calculation of induced e.m.f. in a conductor given the conductor length, flux density and velocity of the conductor.
- calculation of induced e.m.f. in a coil given the number of turns in a coil and the rate of change of flux.

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REQUIRED SKILLS AND KNOWLEDGE

- calculation of force on a conductor given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor.
- Lenz's law
- applications of electromagnetic induction

T5 Inductance encompassing:

- construction of an inductor, including a bifilar winding inductor.
- Australian Standard circuit diagram symbol for the four types of inductor.
- effect of physical parameters on the inductance of an inductor.
- common types of inductor cores.
- applications of the different types of inductors.
- definition of terms self induction, inductance and mutual inductance.
- calculation of value of self induced e.m.f. in a coil.
- mutual induction occurs between two coils.
- graphical relationship between load voltage, current and self induced e.m.f. in a single d.c. circuit having inductance.
- practical applications for the effects of self and mutual induction.
- undesirable effects of self and mutual induction.
- definition of term "time constant" and draw the characteristic curve as applied to a series circuit containing an inductor and a resistor. (LR circuit)Calculation of value of the time constant for an LR circuit given the values of the components.
- time constants required for the current in an LR circuit to reach its final value.
- determining of instantaneous values of voltage and current in an LR circuit using a universal time constant chart.

T6 Measurement Instruments encompassing:

- moving coil, moving iron, dynamometer meter movements and clamp testers.
- practical applications for moving coil, moving iron and dynamometer meter movements.
- Calculation of resistance of shunts and multipliers to extend the range of ammeters and voltmeters.
- factors to be considered in selecting meters for a particular application.
- safety category of meters and their associated applications.
- steps and procedures for the safe use, care and storage of electrical instruments.

T7 Magnetic devices encompassing:

- construction, operation and applications of relays.
- construction, operation and applications of contactors.
- magnetic methods used to extinguish the arc between opening contacts.
- construction, operation and applications of Hall Effect devices.
- operation and applications of magnetostriction equipment.
- construction, operation and application of magnetic sensing devices.

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REQUIRED SKILLS AND KNOWLEDGE

T8 Machine principles encompassing:

- basic operating principle of a generator.
- applying Fleming's right hand rule for generators.
- basic operating principle of a motor.
- applying Fleming's left hand rule for motors.
- calculation of force and torque developed by a motor.

T9 Rotating machine construction, testing and maintenance encompassing:

- components of a d.c. machine.
- difference between a generator and a motor in terms of energy conversion.
- nameplate of a machine.
- using electrical equipment to make electrical measurements and comparison of readings with nameplate ratings.
- Identification of faults in a machine from electrical measurements.
- care and maintenance processes for rotating machines
- safety risks associated with using rotating machinery.

T10 Generators encompassing:

- basic operation of a d.c generator.
- calculation of generated and terminal voltage of a d.c. shunt generator
- prime movers, energy sources and energy flow used to generate electricity.
- types of d.c. generators and their applications.
- methods of excitation used for d.c generators.
- equivalent circuit for a d.c. generator.
- importance of residual magnetism for a self excited generator.
- open circuit characteristics of d.c. generators.
- load characteristics of a d.c generator.
- reversing the polarity of a d.c. generator
- Connect and test a d.c generator on no-load and load
- Identify safety risks associated with using generators.

T11 Motors encompassing:

- operation of a motor and its energy flow.
- effect of back e.m.f. in d.c. motors
- torque as the product of the force on the conductors and the radius of the armature/rotor.
- types of d.c. motors and their applications.
- circuit diagrams for the types of d.c. motors.
- equivalent circuit for the types of d.c. motors.
- calculation of power output of a motor.
- characteristics of the different types of d.c. motors.
- connection and testing a d.c. shunt motor on no-load and load

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REQUIRED SKILLS AND KNOWLEDGE

- reversing the direction of rotation of a d.c. motor.
- safety risks associated with using motors (include risks of series d.c. motors).

T12 Machine efficiency encompassing:

- losses that occur in a d.c machine.
- methods used to determine the losses in a d.c. machine.
- calculation of losses and efficiency of a d.c machine.
- efficiency characteristic of a d.c. machine and the conditions for maximum efficiency.
- application of Minimum Energy Performance standards (MEPS).
- methods used to maintain high efficiency.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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EVIDENCE GUIDE

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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EVIDENCE GUIDE

- Solve problems in electromagnetic circuits as described as described in 8) and including:

A Using methodological techniques to solve problems in circuits with an electromagnetic device from measure and calculated values

B Determining the operating parameters of an existing circuit with an electromagnetic device.

C Alternating an existing circuit with an electromagnetic device to comply with specified operating parameters.

D Developing circuits with electromagnetic devices to comply with a specified function and operating parameters.

E Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in electromagnetic devices and related circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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EVIDENCE GUIDE

	assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9**.**5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving problems in electromagnetic devices and related circuits by:

- Determining the operating parameters of an existing circuits with electromagnetic devices
- Altering an existing circuit with an electromagnetic device to comply with specified operating parameters
- Developing circuit with an electromagnetic device to comply with a specified function and operating parameters

AND

In relation to the following on more than one occasions:

Solving problems

- Connecting circuits,
- Using methodological problem solving techniques,
- Solving electromagnetic device problems,
- Demonstrate an understanding of the behaviour of current and voltage in circuits with electromagnetic devices
- Calculating circuit parameters accurately,

Circuit and device testing

- Choose correct instruments and ranges for testing,
- Connect meters to measure parameters in circuits with

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RANGE STATEMENT

electromagnetic devices,

and

At least four of the following electromagnetic devices

- Reed switches
- Solenoids
- Relays
- Contactors
- Inductive limit switches
- Bells
- Lifting magnets
- Core balance devices
- Magnetic overloads
- Motors
- Generators
- Magnetic brakes
- Magnetic circuit breakers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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2.2) Literacy and numeracy skills

Competency Field **5)**

Electrical

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UEENEEG102A Solve problems in low voltage a.c. circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers ascertaining correct operation of single and three phase a.c. circuits and solving circuit problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, multiphase circuit arrangements, issues related to protection, power factor and MEN systems and solutions to circuit problems derived from calculated and measured parameters.

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

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Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Elements and Performance Criteria Pre-Content

6) Elements describe
the essential outcomes
of a unit of competency

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to solve low voltage a.c. circuit problems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
		1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
		1.4	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve low voltage a.c. circuit problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
\		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Established methods are used to solve circuit problems from measure and calculated values as they apply to single and three-phase low voltage circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and Solving single and three phase low voltage circuit problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG102A Alternating current power circuits

Evidence shall show an understanding of alternating currents power circuits to an extent indicated by the following aspects:

T1 Alternating Current Quantities encompassing:

- sine, cosine and tangent ratios of a right angle triangle
- Pythagoras Theorem to a right angle triangle.
- use of the CRO to measure d.c. and a.c. voltage levels

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REQUIRED SKILLS AND KNOWLEDGE

- sinusoidal voltage generated by a single turn coil rotated in a uniform magnetic fields
- terms 'period', 'maximum value', 'peak-to-peak value', 'instantaneous value', 'average value', 'root-mean-square (r.m.s.) value', in relation to a sinusoidal waveform.
- calculation of the instantaneous value of induced voltage of a generated sinusoidal waveform.
- measurement of instantaneous, peak, peak-to-peak values and the period of a sinusoidal waveform.
- calculation of root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform from values of peak voltage and period.

T2 Phasors Diagrams encompassing:

- purpose of phasor diagrams
- 'in-phase', 'out-of-phase', 'phase angle'' lead' and 'lag'.
- phase angle between two or more alternating quantities from a given sinusoidal waveform diagram.
- convention for representing voltage, current and the reference quantity in a phasor diagram.
- drawing phasor diagrams to show the relationship between two or more a.c. values of voltage and/or current.
- determination of phase relationship between two or more sinusoidal waveforms from a given diagram and measurements.

T3 Single Element a.c. circuits encompassing:

- setting up and connect a single-source resistive a.c. circuit and take voltage and current measurements to determine the resistance
- determining the voltage, current resistances from measure of given values of any tow of these qualities.
- relationship between voltage drops and current in resistive a.c. circuit
- applications of resistive a.c. circuits
- defining ‘inductive reactance’.
- calculation of inductive reactance for a given inductor and the relationship between inductive reactance and frequency.
- applying Ohm’s Law to determine voltage, current of inductive reactance in a purely inductive a.c. circuit given any two to these quantities.
- applications of inductive a.c circuits.
- calculation of capacitive reactance
- applying Ohm’s Law to determine voltage, current or capacitive reactance in a purely capacitive a.c circuit given any two of the quantities.
- applications of capacitive a.c circuits

T4 RC and RL Series a.c. circuits encompassing:

- impedance and impedance triangle.
- determining the impedance, current and voltages for a series RC circuit given the resistance, capacitance and supply voltage.

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REQUIRED SKILLS AND KNOWLEDGE

- drawing and labelling the impedance triangle for a series RC circuit
- drawing phasor diagrams for a series RC circuit
- AS/NZS 3000 requirements for the installation of capacitors.
- examples of capacitive components in power circuits and systems and the effect on the phase relationship between voltage and current.
- determining the impedance, current and voltages for a series RL circuit given the resistance, inductance and supply voltage.
- drawing and labelling the impedance triangle for a series RL circuit
- drawing the equivalent circuit of a practical inductor
- Draw phasor diagrams for a series RL circuit.
- examples of inductive components in power circuits and systems and describe their effect on the phase relationship between voltage and current

T5 RLC Series a.c. circuits encompassing:

- measuring component voltages in a series RLC circuit and using a phasor diagram to determine the supply voltage and phase angle between circuit voltage and circuit current.
- determining the impedance, current and voltages for a series RLC circuit given resistance, inductance, capacitance and supply voltage.
- drawing and labelling the impedance triangle for a series RLC circuit.
- calculation of total impedance for a series RLC circuit.
- calculation of voltage drop for cables using the values for reactance and a.c. resistance from AS/NZS 3008.
- comparison of current limiting characteristics of inductors and resistors.
- practical examples of RLC series circuits

T6 Parallel a.c. Circuits encompassing:

- determining the branch currents of a parallel circuit that contain RL, RC or LC in two branches.
- using a phasor diagram to determine the total circuit current and phase angle in parallel RL, RC or LC circuits.
- determining the total circuit impedance of parallel RL, RC or LC circuits.
- measuring the branch currents in a parallel RLC circuit and use a phasor diagram to determine the total current and phase angle between circuit voltage and circuit current.
- determining the branch impedances, branch currents and phase angles voltages for a parallel RLC circuit given resistance, inductance, capacitance and supply voltage.
- calculation of impedance for a parallel RLC circuit.
- practical examples of parallel circuits.

T7 Power in an a.c. circuit encompassing:

- difference between true power, apparent power and reactive power and the units in which these quantities are measured.
- drawing the power triangle to show the relationships between true power, apparent

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REQUIRED SKILLS AND KNOWLEDGE

power and reactive power
- defining the term "power factor" and phase angle.
- methods used to measure single phase power, energy and demand.

T8 Power Factor Improvement encompassing:

- effects of low power factor.
- requirements for power factor improvement.
- methods used to improve low power factor of an installation.
- local supply authority and AS/NZS 3000 wiring rules requirements regarding the power factor of an installation and power factor improvement equipment.
- methods used to measure single phase power factor.
- using manufacturers catalogues to select power factor equipment for a particular installation

T9 Harmonics and Resonance Effect in a.c. Systems encompassing:

- term "harmonic" in relation to the sinusoidal waveform of an a.c. power system.
- sources in a.c. systems that produce harmonics.
- problems that may arise in a.c. circuits as a result of harmonics and how these are overcome.
- methods and test equipment used to test for harmonics
- methods used to reduce harmonics in a.c. power system
- conditions in a series a.c. circuit that produce resonance.
- dangers of series resonance circuits
- conditions in a parallel a.c. circuit that produce resonance.
- dangers of parallel resonance circuits
- AS/NZS3000 and the local supply authority requirements concerning harmonics and resonance effect in a.c. power systems.

T10 Three Phase Systems encompassing:

- features of a multiphase system.
- comparison of voltages generated by single and multiphase alternators.
- reasons for the adoption of three phases for power systems.
- how three phases is generated in a single alternator.
- Calculation of r.m.s. value of voltage generated in each phase given the maximum value.
- relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each.
- term "phase sequence" (also, referred to as "phase rotation").
- determining the phase sequence of a three phase supply

T11 Three phase star-connections encompassing:

- connecting a three phase star-connection load.
- phase relationship between line and phase voltages and line and phase currents of a

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REQUIRED SKILLS AND KNOWLEDGE

star-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.
- terms "balanced load" and "unbalanced load".
- effect of a reversed phase winding of a star connected alternator.
- example of balanced and unbalanced loads in typical power systems.

T12 Three phase four wire systems encompassing:

- purpose of the neutral conductor in a three phase four wire systems.
- determining the effects of an high impedance in the neutral conductor of a three phase four wire system supplying an unbalanced load where MEN earthing is employed.
- determining the value and phase relationship of neutral current in an unbalanced three phase four wire systems given line currents and power factors.
- AS/NZS 3000 requirements regarding neutral conductors.
- AS/NZS 3008.1.1 method for determining voltage drop in unbalanced three phase circuits

T13 Three phase delta-connections and Interconnected systems encompassing:

- connecting three phase delta loads.
- phase relationship between line and phase voltages and line and phase currents of a delta-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.
- limitations and uses of open delta connections
- effect of a reversed phase winding of a delta connected transformer
- example of loads in typical power systems.
- drawing the typical combinations of three phase interconnected systems using star-connections and a delta-connection.
- relationship between line and phase voltages and line and phase currents in the typical interconnected systems using star-connections and delta-connections.

T14 Energy and power requirements of a.c. systems encompassing:

- purposes for measuring power, energy, power factor and maximum demand of a.c. power systems and loads.
- difference between true power, apparent power and reactive power and the units in which these quantities are measured in a three phase system.
- drawing the power triangle to show the relationships between true power, apparent power and reactive power in a three phase system.
- methods used to measure three phase power , energy, power factor and demand.
- determining how the power factor of a three phase installation can be improved.
- using manufacturers catalogues to select measurement equipment for a particular installation

T15 Fault Loop Impedance encompassing:

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- term fault loop impedance of a a.c. power system
- determining fault loop impedance using resistance and reactance values from AS/NZS 3008.1.1
- measuring fault loop impedance of typical circuits
- procedures for testing fault loop impedance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will

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EVIDENCE GUIDE

contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single and three phase circuits as described as described in 8) and including:

    A Using methodological techniques to solve problems in circuits in a.c. circuits from measure and calculated values

    B Determining the operating parameters of existing circuits

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EVIDENCE GUIDE

C Altering an existing circuit to comply with specified operating parameters.

D Developing circuits to comply with a specified function and operating parameters.

E Determining the cause of low power factor in an existing circuit.

F Determining conditions causing an existing circuit to be unsafe.

G Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving single and three phase low voltage circuit problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent

9.5)

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assessment and relationship with other units	For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving problems in a.c. circuit by:

- Determining the operating parameters of existing circuits
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters of voltage, current, impedance, power and power factor
- Determining the cause of low power factor in an existing circuit.
- Determining conditions causing an existing circuit to be unsafe includes electric shock hazard from indirect contract with conductive parts, insufficiently low impedance of a fault current path and inadequate fault protection.

In relation to the following on more than one occasions:

Single phase circuits

- Connecting single-phase circuits
- Choosing correct instruments
- Taking measurements correctly and accurately.

Three-phase circuits

- Connecting three-phase circuits
- Choosing correct instruments
- Taking measurements correctly and accurately.

AND

At least four of the following applications

- Series a.c. circuits
- Parallel a.c. circuits

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RANGE STATEMENT

- Series / parallel a.c. circuits
- Single phase motors / controls
- Three phase motors / controls
- Synchronous machines
- Transformers / Auxiliary components
- Star connected circuits
- Delta connected circuits
- Star-Delta interconnected circuits
- Open Delta circuits

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Electrical

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MEM Manufacturing and Engineering

Modification History

Release #	Release Date	Comments
2.1	31 March 2021	Minor Release: • Mandatory training contract pathway added to 13 qualifications • Quantum of hours of workplace practice removed from 94 units of compentency.
2.0	26 June 2019	Major release: • seventeen (17) new qualification, one (1) updated • four hundred and forty-six (446) units of competency • fifty-five (55) imported units of competency • replacement of out-of-date imported units in MEM31219 Certificate in III in Engineering - Industrial Electrician
1.2	31 May 2016	ISC upgrade: • one imported unit updated in MEM31215 • minor adjustments to thirteen units of competency to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities. No change in outcomes.
1.1	16 June 2015	ISC upgrade: • correction to prerequisites listed in MEM10025
1.0	30 April 2015	Initial release

Credit Arrangements

At the time of endorsement of this Training Package no national credit arrangements exist.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2

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